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NEWER DEVELOPMENTS IN OTOLARYNGOLOGIC THERAPY*

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The need for more effective methods of treatment for certain diseases of the ear, nose and throat has forcibly brought to the attention of the otolaryngologist recent advances which have been made with physical therapy. It seems desirable, therefore, to place at the disposal of the specialist and general practitioner the experience and knowledge gained by laboratory and clincal investigations. In order to conduct such studies for the purpose of perfecting technique, as well as to pass judgment on the indications for a given method, a knowledge of anatomy and pathology is extremely important. It is for this reason that much stress is laid on these factors in the discussions which are to follow.

Physical therapy must not, however, be regarded as a new or special system of treatment for ear, nose and throat diseases. Nor, must it be employed to the exclusion of other accepted procedures. It is rightfully, and has been for many years past, a legitimate part of our therapeutic armamentarium, a neglected but valuable adjuvant to recognized surgical and medicinal measures.

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While physical agents, singly and in combinations, can be advantageously employed for various ear, nose and throat affections, they are now of (proven value, particularly in four otolaryngologic diseases. These are chronic suppurative otitis media (non-surgical type), partial deafness, nasal accessory sinus disease, and hyperesthetic rhinitis (perennial hay fever.)

CHRONIC SUPPURATIVE OTITIS MEDIA

The principle which underlies ionic therapy of local septic processes is best understood by the brief explanation of Sir Lewis Jones. "The current is able to convey the ions of an antiseptic chemical into the floor of an ulcer, or into the lining membrane of a sinus, so that the ions are brought into direct contact with intracellular organisms lurking beneath the surface, and out of the reach of antiseptic lotions or ointments." —(Sir Lewis Jones.)

It is further brought out by Jones that the action of the four metals, zinc, copper, mercury and silver is similar, although it is agreed that zinc penetrates deeper than the other metals and is sufficiently antiseptic to meet the requirements of most cases.

Since ionic medication or ionization implies the introduction into the tissues of particles called ions by means of an electric current, it is necessary to know what are the most appropriate sources of this energy. The current employed must be a continuous one and may be obtained from the electric light mains, a battery of dry or wet voltaic cells or a small dynamo.

The modern galvanic apparatus has made possible the utilization of current from the street lighting mains, a fact which has facilitated the procedure of ionization to a very large extent. The newer types of apparatus permit changing of polarity without manipulation of wires, simply by the turn of a small dial, while the current can be accurately measured and gauged by a milliamperemeter.

The reported successes of Friel and others with zinc ionization in certain types of ear suppurations has prompted otologists to give this method a fair trial. If, as has been emphasized, attention will be given to the factors involved in the proper selection of cases, and the careful conduct of the technic, results should be as favorable as those already on record.

The accepted causes of chronicity must be duly considered, for no method of treatment for a chronic "running ear" is likely to be successful in the presence of complicating pathology in the ear, nose, nasal accessory sinuses, or pharynx. In children in particular due care must be exercised in the removal of adenoid tissue, for it is now firmly established that infected adenoids are one of the most important causes of otorrhea.

In adults, adenoid tissue is usually atrophied. The tonsils, nose and accessory sinuses, and teeth must be carefully investigated. In addition, organic diseases such as tuberculosis and syphilis must either be excluded or corrected.

In the ear itself, local causes are often to be dealt with. Granulations, polypi, caries and external skin infections call for prompt attention, and preliminary treatment should be directed to them because they usually interfere with permanent results.

The selection of cases is all important. Of the many classifications of chronic otorrhea offered, that of Alexander of Vienna (5) clearly defines the indications for zinc ionization. The classification is as follows:

Chronic Otorrhea:

1. Simple.
2. Surgical.
   (1) Chronic suppurative osteitis.
   (2) Cholesteatoma.
   (3) Ulceration or stenosis of external canal.
   (4) Suppurative mastoiditis.
   (5) Chronic suppurative attic or antrum infection.
3. Intracranial complications.

Only the simple type of chronic otorrhea lends inself for ionization treatment.

Proper technic in the conduct of the procedure is important. Emphasis should be made on the necessity of thorough cleansing of the ear canal. In this connection Friel (6) states: "Chronic otorrhea is due in many cases solely to the presence of septic material in the tympanum. If we remove the microscopic mass from the cavity by syringing or swabbing, and sterilize the microscopic layer adhering to the surface, the irritation causing the discharge should now be nonexistent, and as a result the discharge should rapidly and completely disappear, and this event should be consistently obtained."

The steps in the technic may be enumerated thus:

1. The ear is cleansed thoroughly and irrigated with a weak zinc sulphate solution.

2. The patient lies with the infected ear up and the ear canal is filled with zinc solution (one grain zinc sulphate to one ounce of water.)

3. With a galvanic apparatus, a zinc wire is connected to the positive pole and the other end

of the wire passed into the ear canal which is first protected by a rubber sleeve or speculum.

4. The negative pole may be either a moist sponge electrode, or a piece of lead foil placed anywhere on the body.

5. Two to four milliamperes of current are allowed to pass from ten to fifteen minutes.

Self-Retaining Ear Speculum for Ionization

In order to simplify the technique, a self-retaining ear speculum for ionization has been devised. This simple apparatus offers many advantages. It is easily self-retaining; the indifferent electrode is part of the same apparatus. The accompanying illustrations (Figures 1 and 2) show in detail the parts, including the leather head band, the vulcanite ear speculum and holder, the feltpad-electrode on reverse of headband, the binding posts for attachment of cords, etc. (Fig. 3).

For irrigating the ear canal with zinc solution, an irrigating bottle and tip has been perfected. The bottle is connected by hose with any compressed air outlet and the tip is so arranged that the cleansing procedure is always under direct vision. It is more simply operated than a metal syringe and is time-saving.

Clinical Results

Friel has at numerous times given statistical accounts of cures effected. In 1922 (7) he reported on 102 cases of otorrhea due to tympanic sepsis. Of these 83 were known to be cured, 14 were lost sight of, and 5 were still under treatment; 58 of the 83 were cured with one treatment and 12 more required only the insufflation of boric acid on the second visit, one week after the first treatment. The remainder required either a few more ionizations or insufflations of boric acid or both.

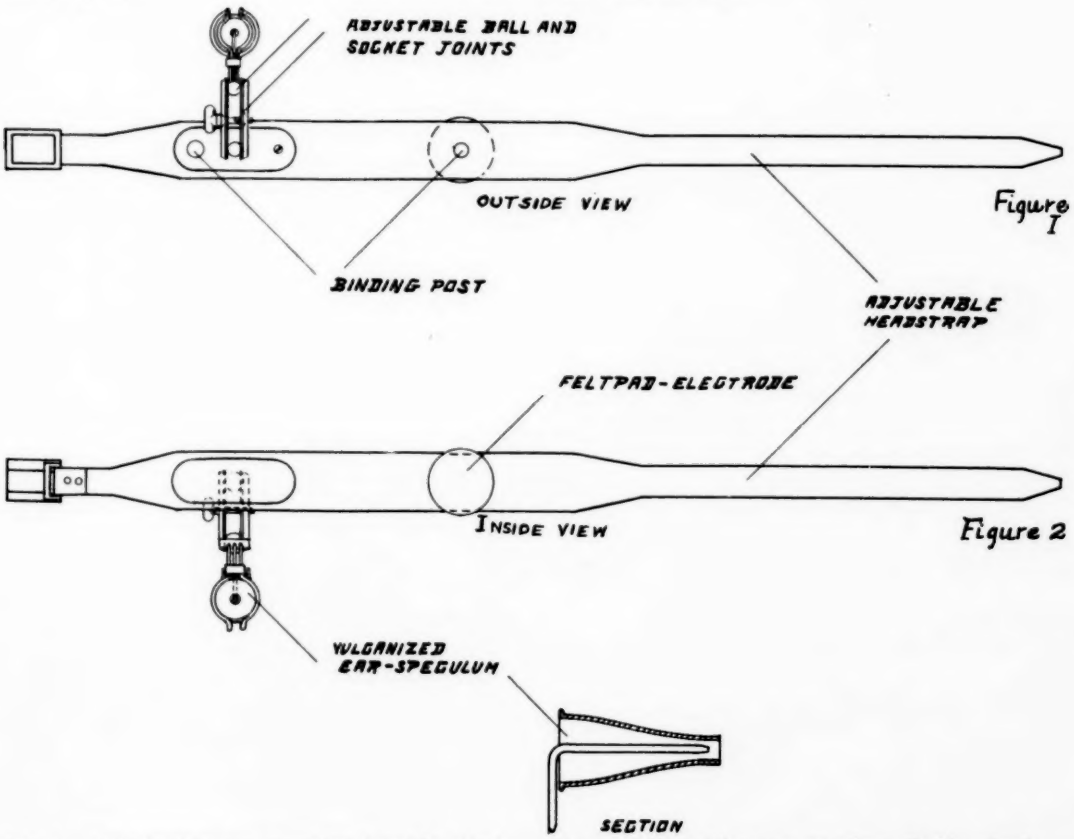

Fig. 1.—Self-retaining ear speculum (outside view.)

Fig. 2.—Self-retaining ear speculum (inside view.)

Kanter (8) treated 70 cases of otorrhea and reported results which are tabulated as follows:

Number of ears treated, (34, disease in one ear; 18 in both ears.)

Results not known (did not return after first treatment)	13
Number of ears, results known	57
Ears dry after first treatment	40
Ears dry after second treatment	8
Ears dry after third treatment	5
Ears dry after fourth treatment	2
Not improved (this includes case that cleared up after tonsillectomy)	2

Jobson (9) treated suppurating ears by ionization, and in 29 otorrhea ceased rapidly, 2 relapsed after a few weeks, 13 were not cured, and in 3 cases the result is not known. This gives 60 per cent of cures. Of the patients not cured, 6 had cholesteatoma and 2 had been operated for mastoiditis. Twenty-two of the successful cases required only one ionization; 4 required two treatments; 2 received three treatments, and only one as many as four.

Case Reports

In a series of 50 cases of chronic otorrhea 21 were selected as being appropriate for zinc ionization, the remaining number had complications which necessitated a classification other than simple otorrhea. Of the 21 cases, 10 have gone sufficiently long since the ionization to be pronounced cured. In six of the remaining number there has been cessation of the discharge, but sufficient time has not elapsed to pass final judgment, while the remaining five are still under treatment, having made relatively poor progress as compared with the other 16 of the series.

COMMENT

Experience has confirmed the views of Friel, who holds that zinc ions coagulate albumen and the electric current makes the ions penetrate to the depth required. When coagulation of the albumen of cells occurs, whether they are tissue cells or bacteria, it involves their death. In cases of tympanic sepsis, treatment by ionization alone is sufficient, especially so, if the perforation in the drum membrane is large enough to allow the introduction of the zinc solution and its distribution in sufficient amounts. If the opening is too small, the solution should be injected through the perforation with the irrigating apparatus already described.

PARTIAL DEAFNESS

Certain types of defective hearing are now treated by physical measures (10). Sufficient studies have not yet been conducted to warrant assertions with reference to the influence of physical agents on nerve deafness and on otosclerosis (11).

The fundamental factors before any method of treatment is instituted should be noted. Nasopharyngeal diseases must be either excluded or corrected. Systemic diseases should be carefully investigated and their influence on the hearing considered. A diagnosis of the type of impaired hearing must be arrived at and an examination of the hearing made with voice tests, tuning forks and the more modern method, the audiometer.

In spite of improved methods for measuring the hearing, recent experiences have pointed to the fact that the therapeutic test is probably the only reliable diagnostic test.

Fig 3.—Self-retaining ear speculum in position for use.

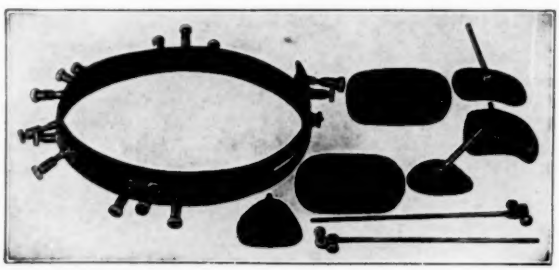

Fig. 4.—Hollender-Cottle Headband and Electrodes.

Rational treatment must take in consideration the presence of organic diseases, blood dyscrasias, endocrine dysfunctions and vitamin deficiencies. When these have been investigated and corrected, local measures to the ear itself are indicated.

Laboratory and clinical investigations have established the value of diathermy and negative galvanism for their local effects (12). This treatment involves the use of a head band and electrodes (Figure 4). The electrodes are made of a rubber sponge material and are covered with mesh. The active electrode is so shaped as to fit over the mastoid (Fig. 5) while the indifferent electrode is oval and fits conveniently over the side of the face opposite to the ear being treated (Figure 6). Diathermy introduced by way of the ear canals does not reach the middle and inner ears with adequate intensity; diathermy introduced by an active electrode behind the external ear, with the indifferent electrode anterior to the ear on the opposite side, produces a substantial rise in temperature in the region of the ear from the middle ear to the inner surface of the skull. A maximum temperature is reached after ten minutes application with a current of 250 to 350 milliamperes. The duration of a single treatment is twenty minutes, after which negative galvanism is applied through the same electrodes, for a period of five minutes. This is accomplished by changing the cords from the high frequency machine to the galvanic apparatus and interposing a pad moistened in saline solution, underneath the active electrode.

What are the indications for diathermy and galvanism? There are certain structural changes in the mucous membrane which may or may not approach fibrous connective tissue formation or fixation of the ossicles. Such changes frequently occur in chronic otitis media. Diathermy properly administered effects absorption of calcified deposits, increases the arterial flow in the part treated and augments the return circulation. Diathermy aids in the absorption of effusions, the softening of exudates and fibrous tissue and the relaxation of muscle spasms. By its action on the immediate circulation and its ability to produce hyperemia, intercellular tension is altered and cellular activity stimulated.

For otosclerosis, besides local diathermy, general body irradiations with the air cooled mercury vapor quartz lamp are indicated. This measure augments the calcium content of the blood and alters general body metabolism.

The adjuvant action of negative galvanism as a follow-up in the local treatment must not be overlooked. The negative galvanic pole is capable of aiding in the softening and relaxing process.

NASAL ACCESSORY SINUS DISEASE

The action of diathermy is also of distinct advantage in nasal accessory sinus disease. Characteristic changes in the acute and early

Fig. 5.—Active electrode over mastoid area.

Fig. 6.—Indifferent electrove over side of the face opposite to the ear being treated.

chronic sinusitis are of no special significance because resolution is very frequently possible.

"If, however, from any cause, the pathological process continues with damming back of secretion, the inflammatory symptoms become more marked. Greater changes such as round cell infiltration, petechial hemorrhages and desquamation occur in the mucosa. The round cell infiltration penetrates the deeper layers until the bone is reached, causing pressure, with subsequent tendency toward ulceration caries. Complete resolution cannot occur after this stage of inflammation, for the destruction has been so extensive as to preclude the possibility of nature overcoming these pathological changes. The mucosa is thickened from the overgrowth of fibrous connective tissue. The lining membrane, having lost its cilia, is metamorphosed into the squamous or pavement variety. The glands are, for the most part, destroyed and the blood supply greatly diminished by the obliteration of the finer arterioles and veinlets. If restitution does not occur in a given length of time (four to ten weeks) the disease may be said to have become chronic."—Skillern.

Various methods of treatment have from time to time been suggested for acute, subacute and chronic sinus disease. Shrinkage of the nasal membranes by cocaine and adrenalin is a procedure commonly used. Shrinkage plus suction, plus some systemic measures, such as elimination, change of environment and mode of living, have produced good results in many instances. If, on the other hand, this treatment proves inadequate, the use of radiant heat-light to the head and face, once or twice daily, will help materially to ameliorate the acute symptoms, particularly the pain.

The subacute type of sinus disease often yields to the treatment already described. However, should shrinkage of the intranasal membranes be unnecessary because of adequate ventilation, the use of argyrol tamponage (Dowling treatment) (15) is probably of greater advantage. Tampons made of long fibred cotton are wound about suitable smooth tipped metal applicators, and after being immersed in a 10 per cent argyrol solution, are inserted in the middle meatus of the nose and permitted to remain *in situ* for from 20 to 45 minutes.

One observes after such treatment distinct changes of the surface mucosa. The tampons promote a profuse secretion after which the membranes appear less congested. The symptoms in general are rendered less severe.

Radiant heat light may be applied to the head and face while the tampons are in place or after they are removed, after which either capillary suction or suction with the olive glass tip is the routine plan. Following this, intranasal ultraviolet irradiation is of benefit.

Chronic sinus disease, as has been noted earlier in this paper, (as quoted from Skillern) develops if restitution of the membranes of the sinus does not take place in from four to ten weeks. Definite pathological changes are present and the thickened mucosa and overgrowth of fibrous connective tissue require measures capable of returning this state to normal.

The agents best suited for this purpose are diathermy and galvanism. The difficulties have been in the mode of application, but this has now been facilitated by improved apparatus, electrodes and technic.

Diathermy may be administered to the frontal sinus or antrum by surface vacuum or non-vacuum electrodes.

A mono-terminal or bi-terminal current may be employed. The former is obtained from the Oudin or Tesla terminal, directly to the electrode which is placed over the sinus to be treated. Some good effects are possible with this method, but at best it is not entirely satisfactory.

Hayes in his new text recognizes the merit of this treatment and writes as follows: "Sometimes, because of the severe pain, the patient may need some ameliorative treatment, which can be undertaken by applying direct radiant heat to the cheek from a large incandescent

lamp, or by applying a vacuum electrode from a high frequency machine over the antrum." When a bi-terminal current is more desirable, the patient lies on the auto-condensation couch and the indifferent terminal is connected to it. Or a metal pad placed anywhere on the body will serve as the indifferent electrode. This latter method is sometimes called *modified diathermy*.

The ideal method is to apply diathermy directly to the diseased sinus. By means of the band and electrodes, this is simply performed. The technic for the different sinuses varies somewhat. In treating the frontal sinus the active electrode is placed directly over the frontal area (Fig. 7) and the indifferent electrode on the nape of the neck (Fig. 8). The antrum is treated in the same manner, except that the active electrode is placed over the canine fossa of the side involved (Fig. 9). The ethmoids and sphenoid sinuses offer the greaest difficulties in approach. While some effect is undoubtedly obtained by a non-vacuum electrode intranasally, such effect can only be very slight. Theoretically, one should obtain a considerable diathermy action by placing electrodes of equal size on either side of the face. As a matter of fact there is some heat generation in an area in the middle of the head, but this heat is so diffused that it is questionable whether a maximum concentration occurs in the sphenoid and ethmoid sinuses.

Diathermy by any of the plans suggested should be given for from fifteen to twenty minutes daily or on alternate days, depending on the severity and chronicity of the disease. As a follow-up negative galvanism is administered through the same electrodes simply by changing the cords to the galvanic apparatus. Intranasal ultra violet irradiation is of decided benefit, locally, on the nasal mucosa, but does not reach the sinus proper unless, as is sometimes done, a permanent opening in the sinus is made. In such case, the quartz applicator can be placed into the sinus and the full action of the ultra violet rays obtained. An approach to the antrum makes possible also the use of metallic ionization (16) a method which has proved its value for chronic suppurative processes in other parts, principally the middle ear.

Diathermy improves the circulation of the area over which it is applied and aids materially in the removal of waste products. It is sedative, ameliorating pain and promoting drainage, softening fibrous connective tissue and aiding absorption. Diathermy is contraindicated in the presence of locked-in suppuration, but after drainage has been established, it is the agent of choice. Mention has been made of the fact that negative galvanism augments diathermy action.

HYPERESTHETIC RHINITIS

General body irradiations with ultraviolet light as an adjunct in the treatment of partial deafness has already been discussed. In 1923

Fig. 7.—Active electrode over frontal sinus.
Fig. 8.—Position of indifferent electrode.

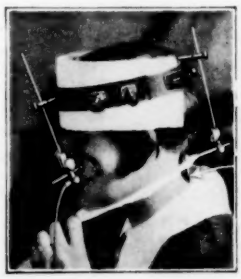

Fig. 9.—Position of active electrode for treatment of antrum.

Novak and Hollender (17) reported on the influence of ultra violet irradiations on the calcium content of the blood serum in hay fever, hyperesthetic rhinitis and the asthmas. This original study and other investigations conducted by us since, (18) have demonstrated that hyperesthetic rhinitis is a calcium deficiency disease. Various methods are known to increase the calcium content of the blood. Calcium either as the lactate or the chloride will act favorably in this way, but the effects are not permanent. Thyroid or parathyroid extract, or a combination of these, very frequently act as a mordant and aid the body in the retention of the calcium by their action on the calcium regulating mechanism, the parathyroids. While the administration of these drugs is adequate in many instances, ultra violet irradiations have given more uniform results for calcium fixation.

The experiments of Hess, Huldschinsky, Kramer, Kasparis and Howland and many others are convincing evidence that ultra violet light will influence favorably rickets, a disease now recognized to be due to calcium deficit. Hess' experiments on rats showed that rickets producing diets will fail to develop rickets if the rats are exposed to the sun. He found further that artificial light produces the same result, particularly the mercury vapor quartz lamp.

Calcium therapy alone is not effective. Clinical tests have demonstrated this. Thyroid and parathyroid extracts frequently give favorable effects because a large majority of the patients with hyperesthetic rhinitis are hypothyroid, at least they may be regarded so from the basal metabolic findings. The more permanent results obtained with ultra violet irradiations are due undoubtedly to alteration of the body metabolism. The ultra violet rays produce a reactivity of the skin with a subsequent systemic reaction. The exact mechanism whereby these changes occur is not yet understood, but this lack of understanding in no way interferes with the clinical usage of ultra violet energy for calcium fixation.

In hyperesthetic rhinitis ultra violet raying of the body will usually give favorable results. The experience of several rhinologists during the past three years with this method of treatment have borne out the original investigations.

CONCLUSIONS

1. The newer developments in otolaryngologic therapy include the use of metallic ionization for chronic uncomplicated otorrheas. Recent reports have definitely shown the value of this treatment. The technic has now been greatly facilitated by a self-retaining insulated ear speculum.

2. Partial deafness of the chronic catarrhal type is successfully treated by diathermy and negative galvanism. This can best be accomplished by applying an active electrode over the mastoid area of the affected ear, and an indifferent electrode over the side of the face anterior to the ear on the opposite side.

3. Diathermy is an indispensable agent in the treatment of certain forms of chronic sinus disease. A thickened and fibrosed sinus mucosa is frequently restored to its normal state. Intranasal ultra violet irradiations are of value for their local sterilizing effect.

4. Hyperesthetic rhinitis is a calcium deficiency disease benefited by general body radiations with ultra violet light act because of their calcium fixing properties.

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INDUSTRIAL PHYSICAL THERAPY*

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Physical therapy is the scientific adaptation to therapeutic purposes of physical measures. Its value was proven during the war in the treatment of war injuries, and no physician who has worked in a hospital with a physiotherapy department would be without one at this time. It has now proven its value in the same classes of cases in industry.

One of the strongest arguments for physiotherapy in industrial injuries is the economical one. There is no dispute that by the combination of good surgery and physiotherapy the period of the temporary disability is shortened in nearly every case and the permanent disability prevented or decreased. Therefore the employer and the employe are benefitted and money saved for both. There is now ample evidence that insurance companies and modern hospitals are fully realizing these great possibilities.

CLASSIFICATION

Physical therapy, according to its time of use may be classified as:

1. Preventive, which is not used in injuries as much as it should be. It is all too frequent for us to see cases of fractures many weeks after the injury, in which the disability is not from the fracture, but from stiff joints due to lack of use. The patients all tell the same story: 'I wore a splint for six weeks, then the doctor told me to use my arm (or leg) at home.' Unfortunately, after six weeks' immobilization a joint is stiff, use causes pain and the pain prevents the patient from using it. It should be recognized that skilled physiotherapy can be given at a far earlier period than is usually allowed. During the war we learned that in infections preventive physiotherapy saved many marked disabilities.

2. Corrective or curative physical therapy is that which is used to correct or cure disabilities following injuries, and is, of course, closely associated with the preventive. The more preventive physical therapy is used, the less corrective is necessary. To correct or cure a disability from an injury is a more difficult task and takes much more time than to prevent the same disability.

The restoration of function should not be left to after treatment which is tedious and time consuming. After treatment gives an impression that one has two stages in the treatment of injuries: the healing and the restoration of lost function. Such a method causes the unfortunate results of adhesions, atrophy, joint ankylosis and contractures all requiring prolonged and painful treatment.

EQUIPMENT

Too often the industrial surgeon, especially in the smaller towns, does not think he can employ physical therapy because the equipment costs considerable money. If, however, discretion and judgment are used in the selection of necessary appliances, the investment will not be so large. Gradually, with a little ingenuity, a surgeon can build up a good physical therapy department that will be invaluable to him in the care of his cases.

A whirlpool bath can be made with a tank 2½ feet high and 3 feet long, 1-inch outlet at the bottom with a stop valve and a 1-inch overflow outlet 2 inches below the top. The water inlet can be connected by a hose to an ordinary bath tub inlet with hot and cold faucets. The water temperature can be regulated by the sensation of the hand as satisfactorily as with a mixing valve. The water inlet is a straight ⅝-inch pipe slightly higher than the tank with an elbow at the bottom about 8 inches long. Into this elbow

*Read at the fifth annual meeting of the American College of Physical Therapy at Chicago, Oct. 18, 1926.

another 5/8-inch upright pipe is attached as high as the first to serve as an air inlet. Inside the elbow of the water inlet is inserted a cone-shaped pipe 5/8-inch at one end and 3/8 inch at the other, about 3 inches long. This increases the force of the stream by decreasing its size and the air inlet gives also increased pressure and a whirling, bubbling movement to the water.

For muscle stimulation nothing is better than the sinusoidal current. A sinusoidal machine along the lines of the Bristow Coil described by Bristow in *Jones Orthopedic Surgery* can be made easily, although the more recent types of sinusoidal apparatus are fully adequate. In the older type of sinusoidal machine the current was furnished by two dry cells.

Resistive exercises is one of the best forms of exercises in which the injured part is worked against increasing resistance of the well member. To mark the increase in strength and motion certain apparatus stimulates interest and shows the patient that while progress is slow, it is being made. This apparatus can likewise be built by any carpenter. For instance an abduction ladder can be built by sawing 1-inch steps in an 8-foot plank 4 inches wide, 1 inch thick, placed upright against the wall, steps outside. A wheel 5 feet wide with a handle on it serves as an indicator and for exercise in flexion and extension of the shoulder. A pulley with a rope and weights makes an excellent elbow exerciser. A tapered cone of wood 3 feet long, 1 inch in diameter at one end and 4 inches at the other, set between wall supports, serves as a wrist and finger exerciser in stiff fingers with limited flexion, going to the narrower part as the condition improves. Thus other indicators and exercise apparatus can be made at little cost.

This equipment is not by any means complete, but it will enable the physician in any place to use some physiotherapy and by these means shorten disability and prevent permanent disabilities in many conditions.

To this equipment the surgeon should add, as the need arises, the remaining essential elements. The first of which would be a portable high frequency machine which will give a good diathermy current. The next in importance is an air cooled ultra violet light.

It should be remembered that physical therapy has definite objects and indications, but there is already a deplorable tendency by some to capitalize on the willingness of the patients to pay for this treatment. I have seen patients given treatments in which rubbing was substituted for massage, ten minutes under a light for radiant heat and a few minutes play with a cheap electrode connected to a cheap high frequency box for diathermy. So while it is better to give some physical therapy than none, the limitations of a small equipment should be realized and not capitalized at the expense of the patient.

The equipment of a modern physical therapy clinic should include apparatus necessary to give all forms of treatment by physical means, including electrotherapy, hydrotherapy, thermotherapy, actinotherapy, therapeutic exercise and remedial gymnastics. An occupational work shop should be connected with it.

A physician should supervise it and the treatment should be administered by trained aides or technicians.

TRAUMATIC SURGERY

In considering this subject it might be well to consider some indications in traumatic surgery for physical therapy.

1. *Muscle or Ligamentous Strains*: are acute cases and the pathology should be remembered. There is petechial hemorrhage, round cell infiltration and serofibrinous exudate. To disperse this exudate and prevent its increase is the object of the physiotherapy. Much harm can be done by misdirected physical means and it is only too often that these cases are sent to a masseuse with the directions for heat and mas-

sage. Massage, except the very lightest in an acute injury, only increases the pathology.

In acute or ligamentous strain radiant heat followed by diathermy is the treatment that will relieve pain and shorten the disability. The radiant light and heat are given from a high-powered incandescent lamp, 1,000 to 1,500 watts, in a reflector and shade or from a hood lined with numerous 60-watt light globes.

Diathermy for muscle strain is usually given by the direct method and for instance, in lumbar muscle strain it is given with mesh electrodes 8 inches by 10 inches, covered with shaving soap lather, one applied over the abodmen and one in the lumbar region with the patient lying on his back on a table. The average milliamperage tolerance is from 1,800 to 2,400. The patient's sensation is only one of deep heat, and any localized heating is usually indicated by a sensation of pin pricking. This is due to lack of contact with the electrode and shows there is a small fulguration spark which will produce a burn, unless the electrode is adjusted. This treatment should last from 30 to 45 minutes.

The patient should be treated daily and between treatments the indication is absolute rest for the sprained muscle or ligament.

When the acute pain has disappeared light manual massage is applied to disperse the effusion, to restore the normal blood supply, to prevent adhesions and thus hasten repair. Petrissage and effleurage in the direction of the lymph flow must be done lightly to guard against fatigue of the muscles and an increase of pathology. The massage should not cause pain. The lymph flow of the erector spinal muscles is toward both cervical and inguinal glands, therefore the massage must be directed upward and downward, instead of in one direction only as in the other muscles.

Later resistive exercises are added to the treatment. These movements are against the hand resistance of the operator and are executed in a direction opposite to the contracted muscles. The antagonists of the spastic muscles work against the resistance, so the spastic muscles have a natural tendency to relax.

2. *Sprain.* Sprained joints, if placed at rest and lotions used, usually owe their subsequent stiffness to the treatment, not to the injury.

To restore a sprained joint to normal motion we use radiant light and heat followed by diathermy for thirty minutes: massage which should be derivative and not local, and early motion. This motion should be passive and limited by the onset of pain. If this rule is observed no damage is done to any torn ligaments.

In giving diathermy to a joint electrodes of mesh molded to the contour of the surface should be used, one on each side of the limb. Care must be taken that the edges of the electrodes do not approach each other too closely, as otherwise the current, seeking the line of least resistance instead of going through the joint as desired, will largely follow along the surface from one electrode to the other. Each plate or cuff is connected with one of the diathermy poles of the machine and the current applied gradually. The current passes through the tissues from one electrode to the other, and the resistance to the current generates the heat which varies directly with the strength of the current and inversely with the size of the electrode. The maximum intensity of heat is developed, not at the surface, but somewhere in the tissues between the electrodes, and can be localized by varying the size of the electrodes used, as the heat is more intense near the smaller electrode.

In giving diathermy to the fingers or foot a good method is to put the member into a small bucket partly filled with warm water—put one tin electrode in the water and the other electrode as a cuff around the wrist or ankle.

In joint conditions the average milliamperage is usually as follows: fingers and toes, 200 to 300; ankles and wrists, 500 to 750; knee, 1,200 to 1,400; elbow, 800 to 1,200; shoulders and hips, 1,200 to 1,800.

3. *Dislocations.* Massage and exercises should be started at once after reduction, under the care of the surgeon. In fact, all joint motions in a recently reduced dislocation should be done by the surgeon himself after baking and massage of the injured joint. The greatest care is essential lest the dislocation recur; therefore, motion should be gradual and not at too great an angle before a week or ten days have passed.

The function of a joint is motion and a joint not moved will become stiff, also the muscles moving a joint are usually supplied by the same nerves as the joint iself, and there is a reflex atrophy of these muscles. This can only be prevented by massage, electric stimulation and proper motion. This is especially important in the shoulder joint as the stability of that joint is dependent upon the surrounding muscle tone.

In a recent case of dislocation of the shoulder the arm was immobilized in a Sayre's dressing.

In other words, complete adduction with internal rotation, the hand resting on the chest and the forearm and the arm firmly tied to the side and front of the chest. In this position the deltoid is pulled tight, the supraspinatus is stretched, the infraspinatus and teres minor are put on tension and the adductors and internal rotators entirely relaxed. The weak group of muscles, namely, the deltoid, supraspinatus, infraspinatus, and teres minor pulled tight, and the stronger muscles which have the greater leverage, namely, the pectoralis major, latissimus dorsi, teres major and subscapular, are relaxed and allowed to contract.

Four weeks later it was found that the external rotation beyond the antero-posterior plane was impossible without severe pain. Abduction was impossible beyond 45 degrees on passive motion, at which time he complained of pain at the end of the acromion and over the greater tuberosity.

Here it is to be emphasized that these shoulder injuries should be treated by 90-degree abduction and external rotation, that early passive and active motion be established and, if possible, radiant heat, sinuisoidal and massage applied at the earliest possible moment.

(4) *Ankylosis of Joints.* Most of the surgical cases in which physical therapy is now used as after treatment are those having stiff joints. These cases in most instances would have been avoided by proper physical therapy during the treatment for the original injury, using the same means now used to cure the stiffness. In other words, the insurance companies and employers are now paying a high cost for this treatment as a curative and corrective measure, when it should have been included in the original treatment cost as the same measures are used as a preventive treatment against stiff joints. To pay a surgeon the cost of a visit to a fracture or a dislocation case in which he looks only at the splint, is not only a waste of money, but is eventually going to cost many more visits of someone skilled in physical therapy to cure the stiff joints following prolonged immobilization. It is not supposed that the surgeon will give massage, but he should see that it is given and he should either give or supervise all joint motions in recent cases.

In all treatment of stiff joints, cases of bony ankylosis and those cases where there is some contra-indication by a pathological process, such as tuberculosis, should be excluded. Where there is a bony obstacle it is useless without surgery to attempt to gain motion beyond the bony blocking. So we have to treat here by physical therapy, stiffness caused by adhesions inside or outside the joint, by inflammatory changes or by retraction of scar tissue.

The preparation of a stiff joint for treatment is to produce an artificial local inflammation, to aid in softening of the fibrous and contracted tissues. The agents are radiant light and heat, the whirlpool bath or the galvanic bath, or diathermy.

The joint is next massaged, manipulated and exercised to disperse the effusion which the pre-

paratory step has created, to mobilize the stiffened joints by passive motions and thus stretch the scars and overcome the contractures.

The muscles are next stimulated by the slow sinusoidal current, which is an alternating galvanic current. The poles alternate from positive to negative so neutralize one another and the term sinusoidal implies that this variation occurs gradually in the form of a sine or wave-like curve. These surging currents should be selected when a gradual, painless and wave-like contraction of the usual physiological type is desired.

ALLIED PHYSICAL AGENCIES

To regain power in atrophied and weakened muscles voluntary work which causes the unconscious use of the limb is the best. In this occupational therapy plays a great part.

Curative occupational therapy is based on the fact that the best remedial exercise is one that requires a series of voluntary movements such as are involved in the ordinary occupations or play. The movements have the advantage of being initiated by the patient and forming an integral and necessary part of a larger and more complex series of co-ordinated movements. There is an incentive in the work that is given by the purposive nature of the work and the end results that is absent in ordinary gymnasium exercise.

Mechano-therapy or formal medical gymnastics consists of exercise on special apparatus or of special character designed for the execution of repeated movements involving specific joints, and has the advantage of isolating these particular joints from the rest of the body and allows for repeated exercises under controlled conditions for limited periods of time. The disadvantage of this method is that the human body is more than a machine when voluntary movements are concerned, and the formal repetition of a movement is not of maximum therapeutic value in increasing the amount of movement in the affected part or in making it of use as an integral part of a larger co-ordinated movement of which each particular movement must ultimately be an essential part.

Mechano-therapy in order to overcome the defects of lack of personal initiative and lack of sustaining effort has now in use machines with devices to measure the amount of movement and strength. In this way the patient is brought face to face with his disability and encouraged to overcome it. These figures are recorded, and the patient attacks his disability directly and watches his improvement from day to day. Even this improvement of this method has its disadvantages as there is no provision to make the one motion treated, inter-co-ordinate with the other movements with which it must ultimately become a part, and it has in many cases a psychological disadvantage in that it makes the patient concentrate on his injury rather than forgetting it.

Curative occupational therapy gives special projects, special tools and special machines to give certain movements that are required. This must be supervised by an aide constantly to see that the patient is making the proper motions, that certain joints are not favored and that certain joints are not overfatigued.

At times it is necessary to retain the correction gained during treatment and to hold it especially at night. This is done by means of a brace.

Charts of treatment with measurements, joint movement and muscular strength should be kept and the patient shown the improvement.

This is the class of cases in which we usually see the so-called breaking up of adhesions under an anaesthetic, and it has been our experience that more harm than good has been done by this method of treatment. We believe that repeated forcible manipulations favor and hasten bony ankyolsis. The joint is a very delicate thing and forcible manipulations under an anaesthetic is a severe injury to a joint. The joint responds to this injury as it does to any other injury, and

there is formed a haematoma within the joint which rapidly goes on to organization and the formation of more fibrous adhesions.

Forcible manipulation in the hands of the experienced surgeon at times is useful.

Fractures are now usually treated by one of three methods:

(1) Complete immobilization, until fragments are united, by splints or plaster casts.

(2) Relative immobilization by traction and suspension best seen with the Thomas splint and traction.

(3) With physical therapy added to one of the above.

When a bone is broken the surrounding structures are injured also. Rigid fixation by splints or plaster without physical therapy withholds from these structures the treatment by which repair can be accomplished, and thus we have added to the original injury, adhesions and atrophy of tissue.

The method of traction and suspension which in itself is a physical measure makes it possible to institute radiant heat, massage and sinusoidal stimulation of the muscles at the bedside from the beginning.

These in the first stage of a fracture hastens the absorption of the hematoma and injured tissue cells and improves the metabolism of the injured parts. Thus it diminishes the pain and lessens the muscle contraction and consequently aids in the reduction and retention of the fragments.

Early joint motion in a limb where there is a fracture prevents joint stiffness and muscle atrophy.

With massage, electrical muscle stimulation and joint motion, muscle atrophy and joint stiffness are prevented and the limb is ready for use when there is union. With complete immobilization there is marked muscle atrophy and joint stiffness and we get the result of a good union but a marked permanent disability from stiff joints.

In delayed unions the use of direct diathermy will act as a stimulant to the production of callus.

SOME TYPES OF INJURIES

Peripheral Nerve Injuries. Corrective splinting and physical therapy are absolutely essential in the treatment of these conditions. As long as there are progressive signs of nerve regeneration no surgical interference is possible, when these have ceased to advance or have not appeared, operation is indicated. In the after treatment of nerve injuries whether operated or not, the essentials are (1) physiological rest in splints to completely relax the paralyzed muscles and to prevent the active muscles from contracting (2) restoration of function by physical therapy.

The health of the motor muscles and nerves depends on use and degeneration follows disuse. The repair is a nutritional problem; therefore, electric stimulation and hyperemia are essential for restoration of function.

These cases report for daily treatment with radiant heat, massage, joint movements, muscle training, and slow sinusoidal electric stimulation. If the patient is from out of town and cannot come daily over the long period necessary for the treatment of these injuries, teach him or a member of his family the use of the Bristow Coil. He uses this at home and reports twice monthly. The greatest danger in electrical treatment of a muscle is that it may form the idea in the patient's mind that his muscle can only move in response to the electrical stimulation.

Muscle and Tendon Injuries. In the after treatment of muscle and tendon sutures movement should always be started in the direction that relaxes the sutured tendon, and thus not put any strain on the suture line. To turn over

one of these cases to one who has had no special training is merely to court disaster. This movement should be started not later than three days after the operation, thereby preventing adhesions.

Amputations. In the after treatment of amputation stumps the whirlpool bath was found to give the most satisfaction.

Malingering. If these cases are given daily treatments, and consistent daily notes kept on their complaints and accurate observations made on their localization of tenderness, they will be shown to be malingering in a week's time, as their attention is distracted by the treatment and they will fail to correctly localize their supposed pain and tenderness.

Ulcers. Varicose ulcers, stump ulcers and others are all stimulated in their healing by the air cooled ultra violet light used at 40″ for two minutes to start and increase the time and decrease the distance.

Spondylitis Deformans—Osteoarthritis of the spine—is one of the bugbears of industrial surgery, and is one of the more common causes of back pain, especially in cases of middle aged laborers who have severe and persistent pain after a mild injury and x ray discloses hook-like processes starting from the edges of the vertebral bodies and frequently involving the sacro-iliac joints and the lumbar spine.

The removal of the exciting cause and the general treatment are important. General complete body radiations with the air-cooled ultra violet light starting at 40″ for two minutes and giving four different exposures every other day aid in this general treatment.

Direct diathermy, electric cabinet baths, radiant light and heat are the best local means to relieve the pain that was found in the treatment of cases at the Veterans' Bureau. Support is indicated if the condition is progressing. Violent exercise, vibration, massage or passive movements increase the pain and were harmful in most cases. In some early cases cautious force and manipulation may be used to restore the normal lumbar curve.

Flat Feet are often due to trauma and the application of supports alone is never satisfactory and exercise, massage, manipulations and sinusoidal currents should be used to strengthen the ligaments and muscles, thus affecting a real cure.

In this brief review of the uses of physical therapy, I wish to emphasize that physical therapy has some definite indications and that the lack of physical therapy in the treatment by many physicians, delays the recovery of these cases. Unless these means are used by us our patients will seek and often obtain relief by osteopaths and chiropractors who will use these methods.

If we use these methods empirically we often get the same lack of results. The choice of methods must be based on complete knowledge of two factors—a complete physical examination and diagnosis of the patient's condition, and second, a thorough understanding of the effects of our physical means. Massage and manipulation are dangerous at times, in others effect wonderful relief. Diathermy at times affords the same relief and in other cases most intense pain as those who have used it in pus cases will remember. We must analyze our cases, be careful in our statements as to the effects of our physical methods or we will not advance the cause of physical therapy or relieve our patients.

GALVANISM—GENERAL PRINCIPLES*

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In taking up a general consideration of galvanism, it seems essential to turn first to the actual physics of this current, in order that one may understand exactly what it is, how it is produced, and what it does. Indeed, seeking to employ any agent without at least a fairly definite conception of its nature and potentialities, is scarcely a scientific action. And today we who are using the various electric currents in the art of medicine, should seek to employ them in a scientific manner, and place them upon a scientific basis in so far as we may, before all else. The charlatan or the cultist may put a box in his office and "give electric treatments" to the gullible laity beyond any question. But the true physician will "prescribe electricity" instead. And how may a man intelligently prescribe either electricity or a chemical medicament without a prior knowledge of the remedy to be employed and its availability in the attack upon disease? He cannot and he should not, regardless of any counter statements, or any glowing salesmanship talk.

Let us therefore take up the galvanic current from the standpoint of its nature, its production and its potentialities.

To begin with, the galvanic current is an unidirectional current. That is, it flows constantly in one direction without alteration of its poles. It is the true direct current. Let us remember this first. One may represent it by a straight line in its primary sense. But, this does not mean exactly what it seems. Few persons uninformed have any true conception of what actually happens when a so-called current flows. In the main one thinks of a stream of energy passing through a conducting substance. Yet this is not really what occurs. And to understand what actually does happen, we must get down to a momentary consideration of the organization of matter—to the consideration of the molecule and atom, before we may gain a true mental picture of how such a current is set up and maintained.

An atom is the smallest known part of matter. Yet the atom is known to consist of a varying number of negatively charged elements known as electrons, upon which its atomic character depends. These electric corpuscles as one may call them, vary from 770 in the hydrogen atom to 150,000 in the atom of mercury, and may well be compared to the planets of the terrestial universe revolving in their orbits in the infinitesimal universe of the atom which they compose.

In its normal state then, the atom consists of a given number of electrons. But this does not always hold true and an atom may lose or take on additional electrons under certain conditions, thereby temporarily destroying its atomic or electronic balance, and converting it into the so-called ion. Get this point: An ion is an electronically unbalanced atom—nothing else under the sun. According to their electronic unbalance ions are divided into those which have lost some of their normal number of electrons, and consequently have acquired a negative charge which will attract them to the positive pole of an electric contact, and those which have gained an excess of electrons and are temporarily positive in their charge with an attraction to the negative pole. Ions with an excess of electrons are known as kations—those with a deficiency are known as anions. It is upon this fact to a large degree that the action of the galvanic current depends.

Because: When a current is passed through the human body or any other conductor, it is

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not the current (which is merely an effect) but the ions contained in the substance of the conductor, which move. Therefore, as Cumberbatch of St. Bartholemew's Hospital, London, puts it: "When the current passes the ions begin to migrate, and *this migration of the ions* is *the current.*" And this current, quite unlike the conception of a stream flowing in one direction, is in reality a double current, in which the ions seek the poles to which each is attracted by its electronic balance—the anion seeking the anode or positive pole, the kation seeking the cathode or negative pole, there to give up its characteristic temporary charge and regain its atomic balance again. Hence, since the current is said to flow from positive to negtive, one may say that the kation flows with and the anion against the stream. As a result it becomes evident that in a current driven through a conductor, the current is conducted by the ions only. This explains why solutions of chemical salts make ready conductors—owing to the fact that the moment a salt is thrown into solution the association of the ions comprising the molecules of the salt, tend to become loosened and this dissociation is greatest when the solution is weakest. In such a condition many ions break away from their atoms and become temporarily abberant.

If then, through such a solution, a current is passed, what happens? The ions, under the force of electro-magnetic attraction and repulsion, begin to migrate each according to its charge—the kations seeking the negative, and the anions the positive poles. Such a solution is known as an electrolyte. It consists of a certain number of undissociated molecules and a certain number of dissociated ions in a fluid bath. With the turning on of the current, the following action is no better described than in the words of the late Sir Lewis Jones. Sir Lewis compares such an electrolyte to a ball room containing dancers united in couples the undissociated molecules, and a certain number of unattached ladies and gentlemen who stand for the dissociated ions. If now there is a mirror at one end of the room, and a buffet at the other, and the ladies and gentlemen make their several ways toward either end according to whether they wish a drink or merely to powder their nose, by the process of changing partners across the length of the room, some idea of the action in the electrolyte under the impetus of the current may be obtained.

And this migration of the ions *is* the current. Let me once more stress that point. In this changing of partners, this oscillation of the molecules of the conductor lies the answer to those who have claimed there could be little effect between the poles at any depth. Yet if it is the migration of the ions which literally forms the current, then the ions must be migrating all the way between the poles or—*no current would pass.* Hence the forced transit of the ions is equal at all points in the conductor, except that —the forced transit of ions *always produces an ionic interchange along its path, in direct proportion to the amperage of the current applied.*

This means diffusion of the current. And diffusion means a spreading out. So that if we wish to reach the deeper structures with a power sufficient to markedly affect them, we must use a fairly high power at the points of contact. For we must not forget that from the electrical standpoint the human body is no more than a bag of skin containing chemical salts in solution—hence an electrolyte.

Consequently, when a current is passed through it, the migrating ions tend to follow the laws of other electrolytes, and diffusion throughout the entire bulk of the electrolyte occurs, while the alkaline ions flow to the negative pole and the acid ions to the positive pole, thereby producing both local and general systemic effects. It is for this reason as an example that we make the acid discharges of an old endocervicitis alkaline, by the use of a negative pole in the cervix, and that we employ the positive pole for the destruction of a mole or wart, with the production of all the acid tissue drying effects. And it is because of this very polarity, as it is known, that we may produce the most

certain and definite effects upon the tissues we desire to treat. It is because of this fact of polarity that we may *prescribe* the type of treatment and feel assured of the reaction we shall set up. Polarity must be understood.

For the negative pole is ALKALINE. It softens and relaxes tissues, or breaks them down if the caustic alkaline action is permitted to become strong enough. It dilates blood vessels, stimulates circulation, hence nutrition, induces hemorrhage, promotes drainage, increases pain and inflammation, is irritant. It ionizes the halogen group and acids.

And the positive pole is ACID. It hardens tissues, firms them up when relaxed. It contracts blood vessels, relieves inflammation or congestion, checks hemorrhage, decreases pain, is sedative. It ionizes metals and certain alkaloids.

And upon this fact of ionization apart from any effect on the contained body ions, depends our ability to directly drive certain chemicals into the local tissues to an extent great enough to insure both a pronounced local action and a general absorption. This is a consideration which we will take up again later on.

So much then for what the current does as it passes. Next let us consider briefly how the current is today produced and its nature of measurement.

Formerly the best galvanic current, and that which even today is perhaps the steadiest and smoothest for very delicate work was derived from wet cells connected in series. Today, however, there are available for all ordinary purposes a number of excellent motor driven machines producing a satisfactory current of the unidirectional type.

Turning again to the current itself, like all other forms of potential energy, it tends always to seek the lower level. And in so doing it exerts a certain pressure, encounters a certain resistance, and presents a certain volume of flow as the mean result.

The measure of electric pressure is the Volt, originally adopted from the pressure created in a copper-zinc battery cell.

The measure of resistance is the Ohm, equal to the resistance of a current of mercury 1 meter high nd 1 millameter thick. The resistance of the human body from dry skin to dry skin may be as high as 3,000 ohms at times.

The measure of the volume of flow is the ampere, being the flow delivered by a current of one volt against a resistance of one ohm. The total voltage divided by the total resistance determines the total amperage according to Ohm's law. But as the ampere is too large a unit for medical work, the milliampere, or the thousandth part of an ampere, has been adopted for all electro-therapeutical use.

Now therefore we have seen that the galvanic current is a unidirectional current, produced chemically by battery cells or mechanically by a motor driven device. We have learned the measurements of its pressure, of such resistance as it must meet, and its rate of flow after that resistance has been overcome, by name at least. We have learned that the current is in reality the migration of atomic electrons called ions within the substance of the conductor through which the current flows. Metals are the best conductors, but medically speaking, we are dealing with electrolytes in the main, and we have learned that the body is literally an electrolyte in the sense that its major volume is water, containing certain chemical salts. Let us turn again to the known fact that when a current is passed through such an electrolyte, diffusion throughout the entire mass of the electrolyte occurs. In this fact we find the explanation as to why a general effect is produced in the body by the passage of the current, aside from any local result. Let us picture for an instant the ions streaming from pole to pole as spread out—diffused—in the interval between the poles, through the substance of the electrolyte itself. And the further apart the poles, the greater this diffusion will be, whether the points of contact are on the same

or opposite sides of the body. Upon this point of diffusion depends not only the general bodily effects already mentioned, but in an opposite sense our ability to concentrate local effects at the poles themselves. For if one will consider, one must see that all these diffused lines of ionic flow, must converge at the poles which are employed as the points of electric contact, so that we may very easily concentrate the entire flow from a large electrode upon another no larger than a needle point. If one will picture a series of lines from the larger electrode to the smaller, he can graphically show how from every diameter of the former they are drawn together at the latter, to concentrate the current effect. It is in this way that to a large extent we are enabled to, as it were, focus the current at the point desired, through the use of suitably sized electrodes employed with a measured current strength. Indeed we may largely *aim* our effect. Electrodes of equal size give balanced local action. Concentration occurs under the smaller electrode always.

These things then we have learned, and having learned them, we are in a measure prepared to consider their application in a medical sense.

At this point let me quote Cumberbatch again. He says: "That migration of ions through the tissues, which is the current, is accompanied by known chemical changes, certain physical changes, certain changes which we call physiochemical or ionic, and certain physiological changes; and it is the response of the tissues directly or indirectly to these changes which results in the cure or the alleviation of disease."

Massey in his work on Practical Electrotherapeutics, names three methods by which a stream of electrons may be applied to medical usage. The first—and the one which concerns us in this discussion—is the application to the tissues of a direct, continuous stream from pole to pole. This is the galvanic current—exercising certain chemical, and phoretic actions on the tissues traversed, ranging from mild physiologic effects to actual coagulation and destruction of tissue substance, provided the current is sufficiently concentrated at the active pole to produce the latter result.

Let us take up these several points. We speak of a phoretic action. The word is derived from the Greek root meaning "to flow," and consequently refers to the stream of ions set up in the tissues in both directions under the current stimulus. Actually in an electrolyte (and therefore in the body) the water molecules have a tendency to flow toward the cathode. And upon this fact depends the explanation of the well-known effect of the negative pole in producing, tissue relaxation, vaso-dilation, and the promotion of drainage, as well as that of the positive pole in causing the opposite effects. As an example one may moisten a bit of cotton and place it in a mucous cavity of the body and connect it with the negative pole and turn on the current. After a few moments he will find his cotton become more moist. Then by reversing the poles and using the anode as the cotton contact, he will find the action also reversed and the cotton drying out. In actual treatment also, we find the positive electrode drying out faster than the negative contacts, so that we must watch them more closely, and at times must remoisten them or else employ a greater voltage to maintain the desired amperage to the end of the treatment period.

Based on these facts Phoresis is divided into:

CATAPHORESIS—which is the dispersion of alkaline ions or water from beneath the anode toward the cathode, and,

ANAPHORESIS—which is the dispersion of acid radical ions from the cathode toward the anode.

This process, depending upon the nature of the substance to be dispersed, is today spoken of as IONIZATION, regardless of which pole is employed.

What the operator must remember, therefore, is that the anode or positive pole disperses or

ionizes the metals, zinc, copper, silver, mercury and certain alkaloids, while the cathode ionizes the halogen group—the most important of which for our purposes are chlorine and iodine, and certain compounds such as quinine form a solution of the sulphate or muriate, and the salicylic ion from solutions of sodium salicylate.

Medically, therefore, ionization may be defined as the driving of foreign ions into the tissues of the body by means of an electric impetus. Foreign ions are diffused into the body in direct proportion to the milliamperage of the current and its time of flow, without any consideration worth mentioning as to the strength of the solution used, over a concentration of 2 per cent. This is true because of the fact that the weaker the solution, the greater the dissociation of the molecules of the salt dissolved, into an ionic condition or form.

This ionization is not great insofar as depth of penetration is concerned. Zinc, for instance, will penetrate about one centimeter under a 20-milliampere current operating for one hour, and iodine to a somewhat greater depth. But—we do not depend wholly upon the depth of penetration for our results. Actually ionization brings about an intra-cellular deposition of the medicinal ion, rather than the intercellular penetration of hypodermic medication or the still more round about penetration of drugs administered by the mouth. And further—by this means the drug, or foreign ion, having been shown to be reduced in the cell after introduction with definite chemical effects, we may by ionization introduce it intra-cellularly at the exact point where it is desired to bring about the major result.

In general, ionization may be divided into sterilizing ionization and medical ionization. In the former we employ mainly the salts of the alkaline earths, which give us an insoluble precipitation when united with the tissue anions (oxygen, chlorine, phosphoric acid, etc.) Due to such property of precipitation, these metallic salts introduced into the tissue it is desired to sterilize form in conjunction with them insoluble or very slightly soluble substances, which under the law of ionic diffusion extend to the depths of the infected tissues, instead of merely affecting the surface in the manner of the antiseptic wash. And further—due to the formation of such insoluble coagula of precipitation between the foreign ion and the tissue ion, the healthy absorbent vessels and spaces are sealed off rather than opened, until the process of repair has caused the destroyed tissue to be eliminated. Such ionization should always be made with bare metal electrodes as the active pole, rather than by trying to employ solutions, with the one possible exception of the use of magnesium sulphate in the treatment of extensive warts.

Conversely medical ionization employs solutions of generally 1 to 2 per cent strength. Here we do not wish to coagulate or precipitate the intracellular substance; but to diffuse within it and the tissues generally, substances which will not only be taken up by the ordinary channels of absorption, but which, owing to their definite positing in the cell, will be held within the desired zone of effect longer than if given either hypodermatically or by mouth.

One of the best examples of medical ionization is the use of chlorin in the form of sodium chloride solution, for the purpose of softening old scar tissue in the soft structures or in fibrous ankylosis of traumatized joints. Another is the use of sodiom salicylate solution for the purpose of ionizing the salicylic radical in the treatment of the arthritides. And another is the employment of iodine which has both a sterilizing and a medical effect when so introduced.

As can be readily seen all these actions depend upon the possibility of ionization, which in turn depends upon the migration of the ions under the current impetus—to the result that such migration produces a chemical effect consistent with the nature of the substance so employed, a physio-chemical effect or change by reason of

the reduction of the foreign ion in the intracellular substance with the ions of which it comes in contact, and a physiological effect as a consequent result.

So much then, for the use of the foreign ion. But it has been rightly said that the galvanic current is the only chemical current *per se*, which is today employed in a medical way, since regardless of any foreign substance which may be employed either as an electrode, as in the case of anodal metallic electrodes, or as solutions, the current using absolutely or comparatively neutral electrodes—i. e. those which the current cannot ionize, such as carbon or platinum balls or needles, or plain distilled water instead of solutions, will still produce chemical effects.

This can be shown in the use of platinum or gold needles in the attack on cavernous naevi, or of gold wire in the treatment of aneurysm. Here the chemical nature of the pole itself, with the release of caustic soda from the negative pole, and hydrochloric acid from the positive pole bring about a direct chemical effect. A coagulation of the blood elements, and a subsequent fibrosis of vessel wall, with an obliteration of the naevus or a limitation of aneurysmal sac results.

Too, we may take advantage of the liberation of caustic, or acid continually in the treatment of local conditions and small or at times even large neoplasms for curative effects, with the marked advantage over any other means of application that we can manufacture at will and exactly where needed our chemical caustic, be it alkaline or acid, in exactly the required amount.

As already indicated, in endocervical conditions it is first the alkalinization of the infected field, by the sodium and hydroxyl ions liberated at the negative pole, plus the drainage brought about through the attraction of the water molecules to this pole, by the process of cataphoresis, that begins the cure. In an alkaline medium the causative organisms do not thrive. And as any surgeon knows the establishment of drainage outwardly militates greatly against the inward extension of infection. This effect having been established by negative pole treatment within the cervix, the process is finally cleared up by a reversal of the process, and the laying down of a barrage of metallic, sterilizing ions within the softened, infected zone from metal anodal electrode, plus the shrinking, toning drying out effect of cataphoresis as applied to this pole.

Speaking of cataphoresis, which aside from any question of ionization, applies essentially to the effect of the current upon the water molecule of the electrolyte or tissues, we have at hand a ready means of combating local swellings and fluid exudates. With the anode over the affected region, we can drive the water molecule from the inflammed or swollen tissues, thereby aiding absorption, with the full assurance that in so doing we shall not only free the tissues of the actual fluid, but that as a secondary result we shall cause the removal of the products of trauma and inflammation as well. At the same time through the vaso-motor constricting effect of the positive current, pain and spasm are relieved.

On the other hand, if we are confronted by a condition of insufficient blood supply, and con sequently undernourishment of a part, we have a means of improving the condition through the proved vasodialating effects of the negative pole. By passing a current along an arm or leg so affected, you may raise the temperature markedly and actually flush the limb with a hot stream of blood from other parts of the body. One may assume that we really do more. Essentially im proved circulation means increased tissue nourishment, and it almost certainly means also the removal of toxic products from the affected tissues—while at the same time the migration of tissue ions which constitutes the current may very well contribute to the same result, thereby

constituting a veritable cleaning out of such products from the body zone involved.

As though indicating that the current does actually have some such cleansing effect, we note the sedative quality of the positive pole in congestions and inflammations. Such action might well depend upon some such explanation. Too, the well-known fact that a fatigued muscle, certainly overloaded temporarily with the toxins of overactivity, may be quickly relieved and brought back to tone by the use of a galvanic current of proper strength. Cumberbatch again believes that in such instances the current actually causes the fatigue products to be swept into the lymphatic channels with a detoxicating result. And it is certain, as already mentioned, that aside from any local action, persons undergoing galvanic treatment for purely local con ditions, frequently speak of the refreshing, invigorating, general effects. In view of such repeated experiences it is hard to believe otherwise than that this current properly employed may weil act as a stimulant to elimination, by literally sweeping retained oxidation products out of the tissues in which they are held. Here then is a marked manifestation of physiological action. Another is in the cases of muscle degeneration, wherein the muscle fibre has lost its response to faradic stimulation. In such conditions by means of a slowly interrupted and rather weak galvanic current, nutrition and electric response may still be so stimulated that the muscle is built up and its faradic response brought back. Such cases are common enough.

One could go on and on, citing instances for this current's application, and proving his case by recorded clinical results. But ours is a general consideration of galvanism rather than a detailed dissertation on its specific use, or a consideration of the technique of application to any specific condition or disease.

Consequently I shall merely point out in a general way its major indications for use.

No current, I think one may safely say, offers a wider or more satisfactory means of treatment in the female pelvis. Here we treat conditions opposite and manifold ammenorrhoea, dysmenorrhoea, menorrhagia, metrorrhagia, endocervicitis, endometritis, infantile development, subinvolution, subacute and chronic cellulitis, cervical erosions, fibromyomata, and uterine displacements, depending as so many of them do on loss of uterine tone, so long as not complicated by motile limitations the result of plastic exudates. Also in atresias of the cervical canal from trauma or as sometimes regretably happens from overenthusiastic surgical attack, we have a ready and comparatively simple means of relieving the unfortunate sufferers, through the negative pole with its proved dilating, tissue softening and breaking down effects. In passing one may mention that in urethral strictures in the male, or in any accessible stricture, the same fact holds good, and such conditions may be easily overcome by the galvanic current wholly without any resort to the knife. Scar tissue or plastic fibrous exudates can always be softened and relaxed by the negative pole under proper technique. In the arthritides, particularly those of the subacute or chronic type, the galvanic current gives excellent results both as to the relief of pain and the actual clearing up of the articular and periarticular conditions. In muscular atrophy and peripheral paralysis, this current is largely the one of choice for first attack at least, giving results after the faradic fails to show any responsive reaction. In these conditions, thanks to its vasodilating, circulatory and hence nutritional effects, the tissues undergoing treatment are freed from the products of fatigue and again built up. For the same reason presumably at least, we find that it is of great value in the treatment of vaso-motor disturbanies, such as endarteritis obliterans, periarteritis and Raynaud's disease. Modified into a wave current, or broken up by a clock work device into an interrupted current, we find it of great service in the treatment of intestinal atony and stasis. Indeed after some nineteen years of experience with it, I feel justified in stating that the longer one continues to use it in an understanding fashion, the wider will he find its possible field of use.

SINE CURRENTS*

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In 1892 D'Arsonval of Paris devised an apparatus to produce a rapid sinusoidal current which consisted of eight stationary coils excited by six permanent magnets revolving within these coils, producing the rapid sinusoidal current by induction.

We used four of these foreign made sinusoidal machines in our daily work for many years, inserting a mechanically driven rheostat in circuit with the patient, which caused the current potential to rise and fall with rhythm, causing subsequent rhythmic muscle contraction.

This relatively crude apparatus proved to deliver the ideal current for muscle exercise, owing to the fact that it was a rapid alternating current caused to surge and was the beginning of subsequent improvement in mechanism for generating wave currents.

Dr. G. Betton Massey in his recent excellent work, describes the modern wave current as applied to therapeutics in a manner which I would not attempt to improve upon,, and which I quote:

'This is the blow-like action of a wave of sudden rise or fall potential of a current traversing a part. This action differs from the continuous current action somewhat as the differences between the force of a steady stream of water, with power due to pressure and volume alone, and that of water waves, which strike an object with a momentum made up also of pressure and volume, but with the added effect of impetus or suddenness."

It is vastly important that the shape, duration and frequency of the surge (wave) should be in keeping and as closely as possible imitate the physiological normal function of the muscle to which it is applied and which is quite easily determined.

We have found in our work that an alternating current of approximately 180 cycles per second produces the muscle contraction with the least sensation of current, due to the fact that as the frequency of cycles increases from 60 upward, the tetanic sensation is less apparent and still the muscle responds to the nerve stimulation at a frequency of about 180 per second as strongly as a lower frequency, but beyond this point, although the tetanic sensation is less, due to increased frequency, the current loses its power to stimulate motor nerves so readily.

The low volt sine wave current from whatever source, is being recognized as a wonderful help in physical therapeutics, but we must learn to become familiar with the normal muscle action of the part to be treated that the result of the applied treatment may not be disappointing.

With the improved apparatus and the present literature on the subject, which may be obtained, there is no reason why the physician may not thoroughly familiarize himself with and properly apply sine wave currents in the many conditions in which this treatment is indicated.

The sine wave, or sinusoidal current. used strictly to produce mechanical effects or alternating contraction and relaxing of muscle tissue to provide exercise and restore muscle tone, should therefore be a rapid sinusoidal current caused to slowly surge to imitate the normal muscle function, for the reason that the rapid sinusoidal current has no polarity effects, produces no skin irritation, or burning sensation under the electrodes and provides an equal contractile energy between electrodes.

Unlike the galvanic sinusoidal current, its power to contract muscle tissue is equal at each electrode and between.

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The galvanic sinusoidal current may be described as a direct current caused to surge and reverse at each period of surge, and though it may be indicated in certain types of work, should never be used for strictly muscle exercise where the rapid surging sinusoidal current is available.

It is obvious that where the slow reversing galvanic current is used for exercise of muscle tissue, and an internal electrode is in place, as for sigmoid stasis, the direct current for the period of one surge will cause intense sensation of burning, providing sufficient current is being used to produce the strength of exercise required to cause increased tonicity, as the electrode for a period of one surge, is carrying the negative pole of a direct current.

A true sinusoidal current is an alternating current, the wave or alternation of which approximates in character the sine curve.

These alternations may be rapid or slow, but in each case may be equally true sinusoidal currents.

Low volt currents of light and power circuits range from 1 to 50 volts. The standard useful voltage of a light or power circuit is from 100 to 500 volts.

There are four types of electrical apparatus used in medical practice as follows:

1. Apparatus to produce sine wave, pulsating direct and galvanic currents ranging from 1 to 250 volts.

2. High frequency apparatus producing currents of from 5,000 to 50,000 volts.

3. X ray apparatus carrying from 10,000 to 300,000 volts.

4. Static apparatus developing up to 1,000,000 volts.

Hence, the sine wave, pulsating direct and galvanic are known as the "low volt" currents of physical therapy.

A direct current of electricity is one which flows in one direction continuously. It is commonly indicated by the abbreviation D. C.

The direction of flow of the direct current is indicated by the signs plus and minus, the current flowing from the positive to negative poles. This determines the "polarity" of the current at each of the two electrodes in contact with the body.

An alternating current is one which flows for a short period of time in one direction, then in the opposite direction for an equal period of time (alternating direction of flow). It is commonly indicated by the abbreviation A. C.

One complete cycle of an alternating current is diagrammatically described by a curve projecting from a horizontal line representing the zero point of no voltage, scribing an arc rising to maximum or peak just above or below the line representing one direction of flow followed by a similar arc in the opposite direction representing the opposite direction of flow.

In an alternating current double the number of cycles occurring each second or minute is called its frequency. The ordinary A. C. lighting circuit has a frequency of 60 cycles per second. The (Alternating) true rapid sinusoidal or sine wave current has no polarity as it reverses its direction so rapidly that each alternation neutralizes the effect of the previous one, except in the case of the galvanic sinusoidal. Any true alternating current, one wave of which approximates a sine curve in character, is called, in medical electricity, the sinusoidal current.

The "galvanic sinusoidal" current has polarity for the period of each surge. It is characterized as one slow-surging, reversing, direct current and flows in one direction for a sufficient period of time to produce polar effects before reversing its direction, such as a burning sensation and irritation of the skin under the surface electrodes when sufficient current is being used to produce deep muscle contractions. The current, in reversing, produces opposite polar effects, neutralizing previous effects, and is accomplished by mechanical means, such as brushes moving over a resistance, or auxiliary brushes caused to move to and fro over the commutator bars collecting current from the D. C. generator.

ARTHRITIS*

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Arthritis is an old story. Medical history records its prevalence in pre-Christian days. Anthropologists exhibit mummy specimens of arthritis replete in pathological aspects similar to the lesions known as classical to us. But in spite of old age, advancement in knowledge and scientific understanding has been slow in development, only the recent past has rewarded the investigator with accumulation of facts such as to augment a wide-spread interest. There is still, however, much to be desired, particularly in correlation of view points.

Classification of the disease as presented, for the most part is the dominant expression of individual writers reflecting endeavors in different fields, etiologic[1], clinical and pathological. This immediately suggests a comprehensive and tolerant respect for opinions and an attempt to grasp a correlation of all as a working basis. Disregarding for the time being, the congenital, the traumatic, the metabolic, the endocrine and nervous types; the acute and chronic, the inflammatory and the proliferative and degenerative type of Nicholas and Richardson (1) embrace a classification which includes all phases and reduces the condition to one unit of approach with each phase, cause, duration and pathology duly recognized. The underlying basic etiological factor is always bacterial and toxemic with numerous exciting conditions to precipitate the onset. Pemberton (2) has given us in his war experiences, a tabulation worthy of scrutiny. Of 383 cases cited, exposure was responsible for:

	No. of Cases.	Percentage.
Exposure	232	58
Dysentery	33	8.25
Injury	30	7.5
Influenza	28	7
"Gas"	23	5.75
Drilling and Hiking	15	3.75
Tonsillitis	13	3.25
Pneumonia	6	1.5
Neiserian Infection	4	1

These figures verify the conclusion of infection and toxemic cause both from basic and exciting aspects.

Altered physiology as created by longer existing or recent infection paves the way and pro duces a susceptible reception for the immediate factor to operate, explaining the traumatic, the "gas" and the exposure incidence. The congenital type arises from developmental alterations and is of interest as a prenatal problem in prevention and an orthopedic effort in treatment. Many speculations and theories regarding split and intermediary metabolic products and chemical end substances have been advanced as etiological factors in arthritis, but experimental proof is lacking for substantiation with the exception of the classical gouty diathesis. The pathological joints developing in the course of some neurological entities such as the Charcot, the pernicious anemia and syrinogomyelia types present problems peculiar to the causative disease and need not be considered. Of late years the endocrine imbalance syndrome has occupied considerable attention as an etiological factor, but it is doubtful whether this state does not produce only an altered physiology, laying a substratum for production of absorption to operate.

Any of the acute infections are capable of joint involvements in the acute type of disease, but there are those more prone to include this condition as a complication, such as acute tonsillitis, rheumatic fever, Neiserian infection, tuberculosis, syphilis, etc. The chronic type has for its predecessor, in the belief of the writer, in 100 per cent of cases a focus of infection more

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or less hidden or obvious. The detection of this focus taxes the skill and patience of the attending medical man, but thoroughness and perseverance usually brings reward. It is true that many cases without demonstrable lesions are encountered, but inability to demonstrate these does not preclude their presence. The entire organism challenges the hunter in his search, tonsil, teeth, sinuses, gall bladder, appendix, tubes, prostate, G. U. tract, gastro-intestinal tract and any degenerating and suppurative process offer formidable points of attack. Of these various foci, I am of the opinion the gastro intestinal tract is most often the culprit and is strangely enough the least often attacked. It is this particular focus I hope to dilate upon.

Klein and Kieler (3) in their series of 186 cases list the source of the focus as shown in chart No. 2:

Source—	No. of Cases.	Percentage.
Intestinal Tract	70	37
Tonsils	66	35
Teeth	39	20
Gall Bladder	25	13
Sinuses	6	3
Prostate	2	1
Unexplained		5

Rea Smith (4) believes that the gastro intestinal tract, due to an unbalanced or perverted intestinal flora, made possible by the failure of some part of the ileocecal coil to empty itself properly, is the focus of infection. He has determined a predominance of the streptococcus associated with many protozoa and amoeba.

Ely (5) is of the firm conviction that traumatic and infectious arthritis comprise all types of joint involvements and from his experiments draws the deductions that all classes can be divided into type 1 and type 11. The first type he states is produced by infection from the tonsils and deep urethra, the type 11 from the G. I. tract, the teeth inclusive. He suspects the protozoan, perhaps the amoeba gingivalis. From our own experiments, as yet unpublished, results confirm the findings of both Smith and Ely and lead to the conclusion that the protozoa are incidental, the streptococcus causative.

Incidence, diagnosis and the clinical course of arthritis are so established and so generally accepted without serious dissenting opinions that the reader is referred to any modern text book for these phases of the disease.

In considering the pathology, selective action, or perhaps response to different stimuli plays a determining factor in resultant lesions. So far as preponderance of facts is demonstrable, there are but two types of pathology, the proliferative and the degenerative. Certain types of invading organisms seem to determine the one or other pathological lesion. Nicholas and Richardson and Ely are closely agreed on this phase of the subject, the proliferative and type 1, the degenerative and type 11 correspondingly accurately. While the two are distinctive they can and very often do occur together, and as it appears at times, blend one into the other. Any of the joint structures, the ligaments, the synovial membrane, the cartilage, the bone may be singly involved theoretically, but clinically this is not the rule, one or more and sometimes all structures participating together, producing the various clinical pictures so well known. In the proliferative, true ankylosis occurs, in the degenerative the joint may be locked, but never from a true ankylosis; this occurs usually from bony outgrowths which inhibit function by mechanical interference. Articles on arthritis by either of the two authors mentioned above deliniate in a most fascinating detail the microscopic as well as macroscopic appearance of these joints and would offer a profitable study to anyone desirous of greater description.

As the causative and pathological aspects of arthritis have become more clearly understood, treatment has advanced commensurately and is still making rapid strides. Recognizing the condition as an infectious process, with the exception of the mild traumas, the secondary joint involvement becomes obvious and the causative disease primary. Two distinct phases present

themselves for attack, first the constitutional, and secondary, the local or arthritis phase. The acute constitutional condition in each instance is reached by treatment of the particular acute infection. Acute tonsillitis responds usually to elimination, the salicylates, the phenyl-cinchoninic acid derivatives, sodium iodine and local applications. Very often the intravenous route hastens a quick recovery with the proper drugs. The joint involvements respond as the constitutional condition is cleared, but the pain and swelling incident to this complication is greatly mitigated by the judicious use of radiant heat, diathermy and infra red. Splinting in a desirable position to maintain rest and prevent deformity is most essential. Often the toxic state is greatly ameliorated by the hot pack and cabinet sweat, this providing the general strength will permit. The acute rheumatic states respond to practically the same routine with perhaps the addition of anti-streptococcus serums. The joint of syphilis is best treated by prevention, through a thorough recognized anti-syphilitic attack. In tuberculosis, the modern method of cure and control has been greatly enhanced by the intravenous administration of calcium, ionizing doses of x ray, diathermy, both locally and generally applied, with the constitutional and local radiation with the ultra violet rays. In the hands of experienced operators most pleasing results have been obtained and although much time is needed the results warrant the trial. Pernicious anemia with the recent high protein diet and modern blood transfusion ought seldom to exhibit nerve or joint lesions. The endocrine joint, if imbalance is present, under a proper detection of offending secretion should be controlled. Here general radiation with the longer rays of the ultra violet lends aid in balancing metabolic processes. Locally radiant heat, diathermy and infra red create a sedation readily permitting the use of affected joints until the imbalance is corrected.

The chronic state, no less than the acute, presents both the constitutional and local joint phases, although the latter usually dominates the clinical picture and presents one or the other of the classical pathological entities. It is very essential to recognize the type and the stage of progress present in each case at hand. It is in these cases that the foci of infection play the major role and act as the constitutional feeder to alter physiological activities and poison the joint mechanism. Search and eradication of foci demand immediate attention providing the patient can withstand the surgical procedure, otherwise a rebuilding of resistance is always wise. The actinic ray supplemented with arsenic and iron, forced feeding, and rest have no peers here, particularly the actinic ray, with daily general radiations until a good tanning is produced. In a preceding paragraph the foci of infection usually sought are enumerated. These foci are given proper attention and their removal very often intensifies the condition for a week or ten days; this is invariably an encouraging sign, indicative of causative toxins temporarily concentrated by raw surface absorption. In a large percentage of cases no other procedure is necessary except local attention which will be described later. At times, particularly in teeth extractions, process necrosis exists and continues to harbor the infection. Do not assume that the mouth can be considered out of the picture because the teeth have been extracted, likewise many times a tag of lymphoid tissue remaining in the tonsil fossa carries sufficient toxin to keep the infectious process alive. Surgical diathermy in such a condition is the treatment par excellence.

When the infected process is hidden in the prostate, massage with the finger or sine current, after diathermy offers a quick relief, providing all phases of the G. U. tract are attended to. In spite of these efforts the invading toxin at times persists and demands further attention. The present mode of attack lies in the administration of foreign protein. Different proteins have been advocated with reports of good results with many. Klein and Kieler recently have reported the use of concentrated Coleys fluid with exceptional results. This appeals not

only because of the foreign protein element, but likewise because of the highly concentrated anti-streptococus element contained.

Smith's theory of cause involves a defective ileoscecal physiology with subsequent alteration of intestinal flora and growth of streptococcus and parasites. In his mode of approach for relief, he establishes surgical drainage through operative interference and subsequent flooding of the G. I. tract with acidsodophylous bacilli. Incidentally 100 per cent of his cases had previously been appendectomized. Results have been extremely favorable. Ely states that removal of the parasites present after other foci of infection have been removed accomplishes like good results. Confirming both authors' work we have not deemed it advisable until absolutely hopeless otherwise to resort to surgical drainage. In its stead medical drainage is obtained through the medium of the sine current. Experience has taught that incompetent ileocecal valve, Lane's kinks and various ptoses and minor adhesions can be corrected in this routine. Furthermore the rhythmical contraction of the bowel under this stimulation assures an even and more thorough distribution of the acidophylous bacilli. Internal administration of mercurochome does not enhance results, but has a tendency to retard the beneficient action of the bacillus, in fact all of the intestinal antiseptics have failed of any benefit in our hands except those that are specific, such as the ipecac derivatives. A few weeks of medical drainage supplemented by actinic exposure and local diathermy brings the beginning of relief and confidence of the patient, but a six-months regimen is required to re-establish normal physiology.

Locally the question of physical therapy physics and stage of the existing pathology must determine the method of attack. Radiant heat for not less than thirty minutes, with infra red following and diathermy for half to three-quarters of an hour concluding is desirable. If the lesion is mono-articular, electrodes must be placed to get the greatest amount of heat to the part and as each treatment progresses, different applications applied. Through and through heat by applying these laterally side to side, with equal sized electrodes, alternating with like electrodes antero-posteriorally accomplishes this effectively. Contrary to many beliefs the cuff method below and above the joint often turns the tide in favor of accomplishment, this alternating with one large electrode above anteriorally and one small electrode below posteriorally so placed as to direct concentration in the joint. Massage and passive manipulation must be a daily part of the treatment, administered immediately after diathermy as the treatment does produce enough sedation to permit motion in otherwise painful joints.

If the lesions are multi-articular the application of electrodes must be such as to include as many joints as possible. In the upper extremity one stream of current should be introduced through the back as high up as possible, including the Brachial plexus roots; the other stream through both hands either by water in pans or electrodes in the hands. In the lower extremity one electrode placed over the lumbo-sacral plexus and the other on both feet. The time of administration must be governed by the heat produced and the effect desired, the dosage by the tolerance of the patient. It is never wise to give less than one-half hour, longer whenever feasible.

In all advanced articular lesions atrophy, non-use and stasis bring a legion of complications; as soon as is permissable these complications must be overcome. Intractable knees and ankle joints, respectively, are often encrusted, due presumably to fixation and disuse of the tensorfascia femoris and other muscles. The sinusoidal current here offers a solution to an otherwise difficult problem.

TO SUMMARIZE

1. Arthritis except that induced by trauma, is a secondary lesion dependent upon a primary constitutional disorder of infectious origin.

2. Local pathology can be classified into two distinct types, the proliferative and degenerative.

3. (a) Treatment demands recognization of the constitutional and local phases, removal of the original and causative factor and the prevention and care of the secondary joint involvements. (b) In the acute type the cure of acute conditions usually suffices; in the chronic, search and eradication of foci of infection with arrest and restoration of joint function are problems of great concern.

4. The intestinal tract is most often the seat of primary infection. Continuous medical drainage and antisepsis through the acidophylous bacillus offer means of correction.

5. Physical therapy plays an important role in prevention and cure of the joint involvement.

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RADIUM THERAPY*

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Radium, as you know, gives off a form of light. You have already heard some excellent discussions of other forms of light. This afternoon we take up still another, which is far outside of the visual field. It has been definitely measured, however, by physicists and located in the spectrum. Radium is really an element which is No. 88 in the periodic arrangement, with an atomic weight of 226. It was discovered in 1899 by Monsieur and Madam Curie, who accidentally stumbled upon it while they were investigating some of the qualities of uranium.

Just prior to that time, you will recall, Professor Roentgen had announced his discovery of the x ray and this led the Curies to feel sure that there was something about uranium which was different from any of the other metals that they had studied and which gave off some sort of a light. Their investigations proved that it was due to the presence of small quantities of radium in the uranium.

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Now the light which is given off from radium, so far as we clinicians are concerned, is divided into three classifications. There are others, but I will not dwell upon those this aft ernoon. The first of these is the alpha rays. The alpha rays are of relatvely long wave length and have practically no penetrating power. A very thin piece of metal will shut them off, so that only when we use radium painted on a plaque do we have the effect of the alpha rays upon the skin when we are using it for therapeutic purposes.

The second type of rays is the beta rays. These have more penetration than the alpha rays and are commonly used in all of our therapy, on cutaneous and superficial lesions. The wall of the ordinary hollow needle into which radium is frequently mounted is made up of a thin sheet of gold or platinum or some metal and allows the beta rays to come through, but shuts off the alpha rays. So that where we are using radium mounted in the hollow needles for skin application, we are using a large proportion of beta rays.

The third type of rays which comes off from radium is known as gamma rays. These are exceedingly penetrating and have the power to penetrate six inches of lead. When it is wished to use this kind of rays only in treatment, then we must use a heavy enough filter to screen out the beta rays, allowing only the gamma rays to come through. In ddition to those three kinds of rays we have emanating from the radium a gaseous substance which is commonly called the emanation of radium or as put out by some of the different manufacturers under the trade names such as Radon.

The emanations are constantly given off from radium. By placing the metallic radium in solution, in acid, the emanation can be collected from the radium and sealed in small capillary tubes. Formerly glass tubes were used for this purpose; more recently they have been enclos ing the emanations in platinum capillary tubes. The radium itself is practically permanent, los ing only half of its value in 1,700 years. On the contrary, the life of emanations is very short, lasting only 132 hours. The effects of the emanation on tissue, however, are the same as the effects of the rays themselves, consequently it can be used for the treatment of disease just as effectively as the radium element; in fact, it has certain advantages over the element. Those advantages are due to the fact that the small capillary tubes in which the emanation is contained can be forced into the tissue and in case of the glass tubes can be left permanently in the tissue. In the case of the platinum tubes, a thread is attached to them and they are withdrawn at the expiration of the activity of the emanation. These small capillary tubes are commonly called "radium seeds." When the glass tubes are used, both the beta and the gamma rays effect the tissue. When the platinum containers are used, some of the beta rays are filtered out, allowing the gamma rays and some of the beta rays to come through.

Due to the fact that radium is constantly active and that we have no way to stop it from being active, we have certain dangers arising in handling it. The x ray, as you know, can be stopped by shutting off the electric current from the glass tube. Radium, on the other hand, is giving off its rays continuously, day and night, whether in use or not. So that the dangers from this must be avoided by certain protective measures. Those who handle radium in getting it ready for application to a patient should always wear rubber gloves. This protects the skin from the softer rays of radium and also from the rays which come off the metal container of the radium which are characteristic of the metal through which the radium rays pass.

Due to the fact that radium rays are a form of light, they follow the same physical laws that other forms of light follow. One of these is what is known as the inverse square law; that is, the quantity of the rays varies inversely as the square of the distance. Let me illustrate. We will suppose that we use a ten-inch distance in administering rays of some sort and then keeping all other factors the same, change to a twenty-inch distance. At first thought one might feel that he would get half the dose at the twenty inch distance that he does at the ten-inch distance, but that is not the case. We should square the ten and square the twenty and then we see that we get at the greater distance only one-fourth the dosage that we do at the closer distance. Expressed mathematically it is $20^2 : 10^2 :: 1 : \times \quad x = \frac{1}{4}$. We take advantage of this law in handling radium. So instead of handling it with the fingers, we use forceps to pick it up. That gives us considerable distance and protects our hands.

Another method is to keep the radium behind lead while it is being prepared for mounting on the patient. Some of the men have devised a lead screen built in a semicircle after the fashion shown in Fig. 1, so that the convex side is toward the operator and the hands are reached around the lead to work with the radium.

Another method of protection is to change frequently the personnel of the nurses who prepare

the radium for use so that no individual nurse will work with it long enough to get a toxic dose.

We have learned, then. in hearing of this danger from over radiation that it must have some effect on tissues, and it does. The first effect which we will describe is that on the blood vessels. All of these actions, of course, go on simultaneously. After tissue has been radiated with radium, within a very few hours the endothelium lining the blood vessels, swells. This swelling becomes so great that in the small terminal capillaries the lumen is entirely occluded. This results then in shutting off the circulation, or in common language starving the tumor. In technical terms we could call it an endarteritis obliterans. At the same time the blood vessels are being affected, we have the effect on the cells of the tumor itself. We have first a cloudy swelling of the nucleus, then rupture of the nuclear membrane followed by cloudy swelling of the entire cell and destruction of the cell membrane and loss of cell identity.

Both of these processes heal by fibrosis. The end result of the treatment, then, is the formation of fibrous and connective tissue. It has been shown by our pathologists, especially McCarthy of the Mayo Clinic, that nature's own defense against the advance of a new growth is the formation of fibrous tissue, so that the microscopist can tell us by looking at a section taken from the margin of the growth, by the amount of fibrosis which is present whether that patient has a great resistance to the growth or whether he has little or none. By his help then, we can make a rather accurate prognosis in any par ticular individual.

All of us have been sunburned and know that the reaction time after exposure of the body to sunlight is but a few hours. On the contrary, the reaction time of radium is much longer; for example, on the unfiltered radium, three to seven days; with the bare needles which I have been describing, seven to ten days; with half a millimeter of silver as filter, ten to fifteen days, depending on the dosage, and with one and one-half millimeters of brass, it will be fourteen to twenty-one days. The more penetrating the rays, the longer the period of time existing between the application and the reaction which follows.

The effective radiation is something that we must look into because a knowledge of that will govern the application of our treatment. Almost everyone nowadays who has radium has it mounted in hollow needles, due to the fact that in many cases we wish to plunge these needles directly into the tumor mass. Where we do that we are able to get more or less of a homogeneous radiation of the entire mass of tissue. On the other hand, if we would apply the radium on the surface of a large mass, that part of the tumor adjacent to the radium would be over-treated, whle that farther away would be undertreated or insufficiently dosed. When we wish to secure as near as possible homogeneous radiation, we push these needles directly into the mass. They should be spaced accurately one centmeter apart. (Fig. 2) Each one of these circles might represent a needle inserted into the mass of tissue, while the lines radiating out from them would represent in a graphic manner the rays passing from the needle which is the central source. Where we have the bare needles placed in the tissue in that manner, it has been found by the physicists and by the clinicians combined that a dosage of 100 milligram hours per needle will be enough radiation to successfully affect one cubic centimeter of tissue. Where that method is used, you can readily see that even around the needle itself there will be a much greater dosage than there would be half way between the two needles. So even with that arrangement we get a small area of necrosis around each needle with the 100-milligram hour dosage.

This method of treatment, therefore, can not be reapplied in the same place more than once, because if we do, we then produce so much fibrous tissue and so much obliteration of the blood supply that we get the same effect that you see in the elderly person who has a gangrene

of the toe from arteriosclerosis. The circulation has been shut off and the part dies. Where we have used radium we call this condition a post-radiation ulcer. Sometimes the growth is so malignant that we take a chance on getting that kind of a thing, thinking that it is the lesser of the two evils. Wherever possible, however, we try to keep the dose below the point where that result will be brought about.

On the other hand, where we use, for example, half a millimeter of silver as filter, and apply the radium in contact with the surface, we will get the greatest dosage adjacent to the capsule along on the surface of the growth. It decreases rapidly as the distance increases, according to the inverse square law shown you a moment ago. The ordinary dosage for this type of filtration will run from fifty to two hundred milligram hours. The silver filter cuts out about 95 per cent of the beta rays and allows all of the gamma rays to come through. When using one and one-half millimeters of brass as filter, most of the beta rays are shut off, allowing only the gamma rays to pass through. The gamma rays equal about 3 per cent of the total radiation coming off from radium. It will be seen then that the dosage will require much greater time because we are allowing a much smaller amount of the radiation to pass into the tissues, consequently the dosage for this method of application runs from 2,000 to 3,000 milligram hours.

I might say a milligram hour is the number of milligrams of radium used in any particular application multiplied by the time in hours. This is the method of estimating dosage commonly used.

It will be seen that the tissue adjacent to the capsule will receive a much greater dosage than that which is farther away. The dosage with 1.5 millimeters brass filtration decreases in the following fashion If we assume that when the radium is placed three centimeters from the skin a dose of 5,000 milligram hours produces an erythema. Professor Bachem, who was here before you this morning, has told us that when 3,000 milligram hours are used, the percentage will be as follows

.5 cm. distance	600%
1.0 cm. distance	300%
1.5 cm. distance	150%
2.0 cm. distance	75%
3.0 cm. distance	45%
3.75 cm. distance	30%

These percentages are based on a 3,000 milligram hour dosage used with one and one-half millimeters of brass covered with hard rubber filter. This is the method commonly used in treating carcinomas of the cervix where the radium capsule can be inserted into the cervical canal. You will see that the portion of the cervix immediately against the capsule will get about six times the dosage that we would like to give it, so there will be considerable destruction of tissue following this dose.

You will notice at one centimeter the dose is decreased about half and at three centimeters, only 4-5 per cent comes through. So the effective area of radiation with this dosage will not run more than two and one-half centimeters away from the radium capsule.

It is important to bear this in mind when we are treating malignancies of large extent, because with that method of application we will not be able to get enough dosage in the more distant parts of the tumor without too much destruction adjacent to the capsule applicator.

Now let us look a moment at the clinical application of radium. Due to the fact, as I showed you a moment ago, that we have a tendency toward the obliteration of small capillaries, it is a very valuable treatment in certain vascular growths, namely, strawberry marks, bright red nevi, port wine stains with hair and without hair, and in deep seated angioma. Some of these, however, are very resistant even to the effects of radium, especially so are the port wine nevi. It is of considerable value in the treatment of toxic thyroid, due to the effect on the blood vessels and also on the cells of the growth.

It is also of great value in the treatment of uterine fibroids, due primarily to the effect on the ovary and secondarily to the effect on the cells of the tumor itself. It is also of value in the treatment of certain skin diseases of the benign type, chronic eczema, lupus bulgaris and erythematosus. It is of value in epithelioma and the inoperable recurrences of carcinoma. It is of great value in the various carcinomas, of the tongue, floor of the mouth, pharynx, esophagus, rectum, uterus, especially of the cervix. It should be used, however, in the treatment of carcinomas of the body of the uterus only in patients who are inoperable from some other cause. Carcinomas of the body of the uterus metastasize so late and can be removed so successfully by surgery that is the method of choice in that particular type.

Radium is also of value in the treatment of post-operative recurrences in the chest wall following amputation of the breast, also for malignancies in the mouth and pharynx.

Radium has certain advantages over x ray. On the other hand, high voltage x ray has certain advantages over radium, but I will leave that for some one else to describe. The advantages of radium are: first, its east of application the patient has no pain; there is no noise or anything of that kind to produce excitement or nervousness, consequently it can be used on children very often where the use of x ray would be impossible without a general anesthetic.

The second advantage of radium is that it is very easily applied in the body cavities whch are accessible from the outside.

The third advantage is the fact that the dosage of radium is very accurate. If we use the same quantity of radium today and the same filter and the same method of application, tomorrow we can absolutely duplicate that dosage. This is not so easy in the administration of x ray, but it is very valuable in the use of radium.

EDITORIAL

ARCHIVES OF PHYSICAL THERAPY, X-RAY, RADIUM

A Journal of Ideas and Ideals.

A. R. HOLLENDER, M. D., Editor

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MENTAL SENILITY

To grow old is a natural biological process, and an inevitable result of living. Given proper nourishment, exercise and rest, the body machinery is remarkably efficient, in spite of the passage of many years. The parts of the body most used and most active, other things being equal, preserve longest their youthful characteristics. The oft repeated phrase of the biologist "Function makes structure," holds good to an advanced age. The tendency to senility of muscles, for example, may be considerably thwarted by continued use of the muscles concerned, and by throwing frequently into play the normal co-ordinations, which are apt to deteriorate with age. New muscular co-ordinations, for example, are acquired with difficulty, if at all, after the optimum period of the acquisition of these co-ordinations has passed. The old adage, "You can't teach an old dog new tricks," has in it more than a grain of physiological truth. Skilful performers on musical instruments, for instance, are those who began their training early in life. The mastery of the pronunciation of a foreign language, likewise, is perfectly acquired during youth, but almost impossible in adult life. These performances are largely muscular in character, and demand a refinement of co-ordination which comes most easily in early life. Hence the value of play in childhood and a free and varied use of the muscles in all sorts of combinations.

Luckily for the race and for society in general, the human brain preserves its vigor and acuteness for a long period of time, even after senescence has stamped its progress on many other tissues and organs. But to possess a vigorous brain, there must be constant exercise of the mental faculties, of the reasoning powers, and a grappling with new ideas and new problems; a kind of mental gymnastics, indeed, which must be practiced if the brain is to remain facile, and able to adapt itself surely and accurately to changing circumstances.

Unfortunately, the tendency of old age is toward a loss of this mental agility. One easily finds himself in mental ruts if his thinking faculties take no new excursions into new fields. The old ways are easier, no doubt; new lines of thought demand effort, and disinclination to effort is one of the signs of old age. To be men

tally alert, therefore, requires deliberate effort to attain the desired goal.

A youthful attitude of mind is one of the most desirable possessions. This may be cultivated, but it is a life long process, and comes only from an habitual state of open-mindedness. If the inappropriate term of "cerebral ossification" may be employed, the idea is well expressed thereby. All of us have noted this mental senescence among our friends and acquaintances, if not in ourselves. The disinclination to keep abreast of the times, to grasp new ideas, to try new methods, is a fatal symptom of this "ossification."

Now physical therapy, and especially electrotherapy, in many respects is new in its clinical application. There are many of our confreres in the medical profession who look askance at these newer agents. May it not denote a degree of mental senescence? Surely none of us have learned all there is to be known, and many of us are dissatisfied with some of the older methods of therapy, in spite of their venerable antiquity. Experimental journeyings into new fields leads to progress, undoubtedly. A sane trial of the new things seems worth while; at least, we should be willing to try them before we decry their usefulness. There is often prejudice against new things; and prejudice is very closely akin to ignorance. Let us remember this old adage, always:

"Be not the first by whom the new is tried,
Nor yet the last to lay the old aside."

J. C. Elsom, M. D.

MODERN PHYSICAL THERAPY

The renewal of interest of all persons in the new physical therapy has awakened both intense advocates and opponents. The general practitioner has felt that he will be side-tracked by lack of equipment, and the specialist in one or another of the medical branches has felt that he may be superseded by machinery in the offices of the general practitioner. The ardent physical therapeutic appliance salesman can not see the need of the prescription pad of the physician, nor the pharmacy of the dispensing doctor; and the purveyors of pills, powders, biologicals, and whatnot have been watching the encroachment of drugless healers in the ranks of regular physicians and surgeons.

Is there need for alarm? Should one regard physical therapy as an undiluted blessing or menace? Hardly. It seems to me that there is room for both. From the point of view of a medical practitioner, who for a decade has been especially interested in the twins of medicine, dermatology and syphilis, it is my conviction that the physician and surgeon today must learn or relearn the tools which the pharmaceutical students, and the physicists can and do supply.

If one has dabbled in the historical aspects of the fields of medicine he can say that physical therapy has been practiced since the dawn of man. Our own Hippocrates, universally regarded as the Father of Modern Medicine, practiced physical therapy, utilizing as he did the natural agencies of sunlight, air, and water. No practitioner of medicine in any age, including the present, would assert that he has *not* used this trinity in his practice. So we have all been physical therapeutists. The past decade has seen a tremendous advance in machinery to supply substitutes for the radiation from the sun; to give heat which is native to the solar body; to make more convenient the application to human ills the penetrating rays of light which are invisible to the eye but which are found emanating from heated bodies as the hot water bag, the heated salt, the hot pack. Mechanical skill has given us the electrothermic method of surgery. It is safest to use the high frequency sector for certain forms of malignancy. It is possibly less likely to lead to recurrence if one properly applies electrocoagulation than the hot point cautery of a generation of doctors ago. Roentgen would be sainted if the medical fra-

ternity canonized its leaders. The Curies, husband and wife, did their share for the amelioration of untold human suffering.

Is there any reason why the physician today should not have available for his patients the fruits of the victories of these and such as these?

On the other hand, have we advanced so that we can use a substitute for quinine in malarial invasion of the human host? Is there some honest physical agent which can supplant modern chemotherapy? Have we learned enough of the physical reactions of the body to be able to find and offer some suitable physical substitute for the sedative action of morphine when and if morphine is the drug which is indicated?

So in a review of matters, the old-timer in medicine still has a place, for he can learn to use the best of modern modalities. He will from pure practical experience still insist on sunlight, fresh air, and water, all physical therapeutic measures which fortunately are beyond the patent control of the most grasping. The generation of new medical men will lack the pharmaceutical knowledge and background of their elders. Is it not true that if no specific is known that the empiric standardized hackneyed prescriptions of the clinic formulary find themselves on the bedside tables of the patient?

So each has something to learn. The one must relearn his physics and the application of physical agents to human beings; the other must learn pharmacology and the principles underlying the action of drugs.

Medicine and surgery have always taken the best from the new, retaining the best of the old, and made new combinations which surpassed what had gone before. Every physician and surgeon seeks what will do his patient most good; every physician and surgeon has and continues to battle on the front which is digging in and destroying the need for doctors: prevention. For this, the highest reaches of service in the practice and art of medicine, we shall continue to use the tools of nature's garden, the fruits of man's laboratory studies. There is no antagonism between physical therapy and pharmaceutical medicine; allies for one cause are not opponents!

HERMAN GOODMAN, B. S., M. D.

PHYSICAL THERAPY WEEK IN KANSAS CITY

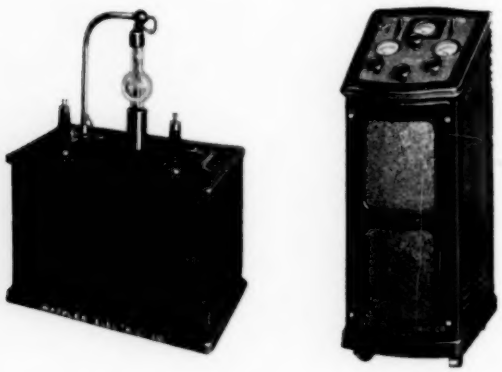
The ninth annual meeting of the Western Physiotherapy Association will be held in Kansas City, Missouri, April 8 and 9, 1927, under the presidency of Dr. Lynne B. Greene. All sessions will be held in the Aztec room of the new President Hotel. An excellent program is in preparation and essayists of national reputation will be present. The annual dinner will be held on Friday evening, April 8.

The ninth annual session of the Western School of Physiotherapy will be held at the same place four days preceeding the Association meeting, beginning Monday, April 4. Classes are now being assembled. For announcement address Dr. Charles Wood Fassett, Secretary, 115 East 31st street, Kansas City, Missouri.

NEW EQUIPMENT

WAPPLER MONEX

While there are continual changes and improvements in apparatus for the use of the roentgenologist, there are occasionally outstanding inventions and developments which seem to mark a distinct era. One such advancement was the advent of the Coolidge Tube.



Another outstanding achievement is the development of the Monex. This was developed in the laboratories of the Wappler Electric Company, Inc., and utilizes the valve tube principles to such advantage that heavy x ray pictures are taken by means of it in faster time than with mechanically rectified devices and in *complete silence*. The apparatus also has the advantage of occupying less space than previous apparatus of similar power.

ENTERS ULTRA VIOLET FIELD

The McIntosh Electrical Corporation has been for a year developing a double duty, that is one that permits orificial, local, or general technique. This is made possible by certain delicate adjustments which are not incorporated in any other ultra violet equipment.

Adjustments can be easily and quickly made to permit perfect technique in nose, throat, ears, vagina, rectum, urethra or in sinuses or fistulae, no matter where located without the "arm breaking" necessity of holding a water cooled lamp in one position for an indeterminate length of time.

Their new quartz book, profusely illustrated and giving all the latest data and ultra violet technique is ready for distribution. Physicians interested in obtaining ultra violet equipment of the highest order at the lowest initial cost and upkeep, should send for this booklet at once, as the first edition is limited.

THE STUDENT'S LIBRARY

BOOKS RECEIVED

This column is devoted to acknowledgment of the books received. Such acknowledgment must be regarded by the sender as sufficient recognition of the courtesy until time and space permit selections to be made for review.

THE MODERN TREATMENT OF HEMORRHOIDS. By *Joseph Franklin Montague*, M. D., F. A. C. S., of the Rectal Clinic, University and Bellevue Hospital Medical College; Lecturer of Rectal Pathology; Fellow American Proctologic Society, New York Academy of Medicine, and New York Pathological Society. Foreword by *Harlow Brooks*, M. D., F. A. C. P., Professor of Medicine, University and Bellevue Hospital Medical College, etc. Cloth. Pp. 296 with 116 illustrations. Philadelphia: Lippincott, 1926.

MEDICINE. An historical outline. By *M. G. Seelig*, M. D., Professor of Clinical Surgery in the Washington University School of Medicine. Price, $3.00. Cloth. Pp. 207 with 48 plates. Baltimore: Williams & Wilkins Co., 1925.

THE DUODENAL TUBE. And its possibilities. By *Max Einhorn*, M. D., Professor of Medicine, New York Post Graduate Medical School; Visiting Physician to the Lenox Hill Hospital, New York. Second Edition. Price, $3.00. Cloth. Pp. 206 with 126 figures. Philadelphia: F. A. Davis Co., 1926.

THE HEART. Its physiology, pathoogy and clinical aspects. By *Dr. Selian Neuhof*, B. S., M. D., Visiting Physician, Central and Neurological Hospital; Consulting Cardiologist Broadstreet Hospital; Associate Attending Physician, Lebanon Hospital; Former Clinical Professor of Cardiology, Fordham University, New York. Cloth. Pp. 701 with 300 illustrations. Philadelphia: P. Blakiston's Son & Co., 1923.

AURICULAR FIBRILLATION. The Ingleby Lectures, delivered Univ. Birmingham, May 6-13, 1925. By *J. G. Emanuel*, B. Sc., M. D., F. R. C. P., Physician to the Queen's Hospital, Birmingham; Consulting Physician Birmingham and Midland Free Hospital for Sick Children; Lecturer in Clinical Medicine. University of Birmingham. Cloth. Pp. 31 with 15 plates. Birmingham: Cornish Brothers, Ltd., 39 New Street, 1926.

EXPERIMENTAL PHARMACOLOGY. A basis for therapeutics. By Dr. *Hans H. Meyer*, Professor of Pharmacology, University of Vienna, and Dr. *R. Gottlieb*, Late Professor of Pharmacology, University of Heidelberg. Second edition in English, translated by *Velyien E. Henderson*, Professor of Pharmacology, University of Toronto. From the Seventh Revision, German Edition. Cloth. Pp. 656 with 87 figures, partly in colors, and 2 colored plates. Philadelphia: Lippincott, 1926.

THE HEART RHYTHMS. By *Paul Dudley Lamson*, M. D., Associate Professor of Pharmacology, Johns Hopkins University. Cloth. Pp. 100 with 52 figures. Baltimore: Williams & Wilkins Co., 1921.

VISUAL FIELD STUDIES. By *Ralph J. Lloyd*, M. D., F. A. C. S., Surgeon N. Y. Ophthalmic Hospital, Ophthalmologist to the Cumberland, Carson C. Peck Memorial, and Prospect Heights Hospitals, and the Brooklyn Nursery. Cloth. Pp. 216 with 124 illustrations. New York: Technical Press, 1926.

DYSPNOEA. Volume V of Medicine Monographs. By *James Howard Means*, Harvard Medical School. Cloth. Pp. 108 with 23 figures. Baltimore: Williams & Wilkins Co., 1924.

RADIOTHERAPY. In relation to general medicine. By *Francis Hernaman-Johnson*, M. D. (Aberd.), Radiologist to the French Hospital, London, and the Margaret St. Hospital for Consumption; Physician in charge x ray and actinotherapeutic department Croydon General Hospital; Diploma in Medical Radiology and Electrology, University of Cambridge; Member of the British Institute of Radiology; Honorary Fellow of the American Electrotherapeutic Association. Cloth. Pp. 211. New York: Oxford University Press, 1926.

TRANSFUSION OF BLOOD. By *Henry M. Feinblatt*, M. D., Assistant Clinical Professor of Medicine,

Long Island College Hospital; Hematologist to the United Israel-Zion Hospital; Pathologist to St. Peter's Hospital; Assistant Attending Physician to the King's County Hospital; and Hematologist to the Shore Road Hospital. Author of Clinical Laboratory Medicine. Cloth. Pp. 137 with 34 engravings. New York: Macmillan Co., 1926.

THE SEXUAL QUESTION. A scientific psychological hygienic and sociological study. By *August Forel*, M. D., Ph. D., LL. D., Former Professor of Psychiatry at and Director of Insane Asylum in Zurich, Switzerland. English adaptation from the second German edition, revised and enlarged by *C. F. Marshall*, M. D., F. R. C. S., Late Assistant Surgeon to the Hospital for Diseases of the Skin, London. Cloth. Pp. 536, with 23 figures. Brooklyn: Physicians and Surgeons Book Co., 1926.

PSYCHOPATHIA SEXUALIS. A medico-forensic study with reference to the antipathic sexual instinct. By Dr. *R. v. Krafft-Ebing.*, O. O. Prof fur Psychiatrie und Nervenkrankheiten an der K. K. Universitat Wien. Only authorized English adaptation of the 12th German edition, by *F. J. Rebman*. Pp. 617. Brooklyn: Physicians and Surgeons Book Co., 353 West 59th St., 1925.

MATERIA MEDICA AND PRESCRIPTION WRITING. By *Oscar W. Bethea*, M. D., Ph. G., F. C. S., Professor Ciinical Therapeutics Tulane School of Medicine; Professor of Therapeutics, Tulane Graduate School of Medicine; Formerly Professor of Chemistry and Professor of Pharmacology, Mississippi Medical College, etc. Cloth. Pp. 498. Philadelphia: F. A. Davis Co., 1926.

PRACTICAL PHYSIOLOGICAL CHEMISTRY. *Sydney W. Cole*, M. A., Trinity College, Cambridge; University Lecturer in Medical Chemistry, Cambridge; Hon. Director of Pathological Chemistry, Charing Cross Hospital Medical School. Cloth. Pp. 480, illustrated. Baltimore: Williams & Wilkins Co., 1926.

EDEMA. Volue III. By *Leo Loeb*, Professor of Comparative Pathology, Washington University. Price, $3.50. Pp. 178. Baltimore: Williams & Wilkins Co., 1923.

BOOKS REVIEWED

PHYSICAL THERAPY IN DISEASES OF THE EYE, EAR, NOSE AND THROAT. By *Abraham R. Hollender*, M. D., Attending Otolaryngologist, American Hospital, Chicago; Editor Archives of Physical Therapy, X Ray. Radium; and *Maurice H. Cottle*, M. D., Attending Otolaryngologist, I linois Masonic Hospital, Chicago. Cloth. Price, $5.00. Pp. 307 with 81 illustration. New York: Macmillan, 1926.

Physical therapy has become recognized as one of our oldest and most powerful means of therapy. By the scientific study, investigation and application of these measures by qualified and ethical members of the younger generation of our profession, these measures have been wrested from the vices of the charlatans and pretenders of medicine to be established as reputable and valuable additions to our armamentarium.

The authors of this work for many years have been doing elaborate and carefully controlled laboratory experiments to determine the effects of these modalities on the various structures of the head. The principles gathered from these observations have been directly applied to oto-rhino-laryngological and ophthalmological diseases. The results of these laboratory and clinical experimentations have been heralded to the profession from time to time in periodical publications. Works of others along these lines have been given careful evaluation and recognition.

In this text, the authors outline the conclusions that have been drawn from their own experiences and the experiences of others. Facts are presented as such, observations are not presented as facts. There is no attempt at theory, no attempt at development of indifferent terms to shield ignorance. Empiricism here plays its role as it does in many of the other branches of medicine. Here too, we must profit by observations made and wait until physiologic and pathologic researches in the laboratory makes its explanation possible.

In the compilation of this data, considerable space is given at first to the discussion of the necessary principles underlying electro-physical agents. The remainder of the text is divided anatomically into treatment of diseases of the eye, ear, nose and accessory sinuses, diseases of the mouth, pharynx and larynx, borderline diseases and a short chapter breathing the essence of their experimental studies.

There is no padding in this text. Although written by young, ambitious, enterprising physicians, pioneers in the field, possessing an enviable vision, there is no undue enthusiasm, no declaration of a discovered pana

cea. Their work has brought forth opinions, offered for what they are worth, likely of error and inviting criticism and further observation. Such a text is worhty of wide recognition. A universal donor for a universal recipient.

MEDICAL DIAGNOSIS. Third edition. By *James M. Anders*, M. D., Ph. D., LL. D., Professor of Medicine, Medico-Chirurgical College Graduate School of Medicine, Univ. Pennsylvania; etc., and *L. Napoleon Boston*, A. M., M. D., Associate Professor of Medicine, Graduate School of Medicine, Univ. Pennsylvania; etc. Cloth. Price, $12.00. Pp. 1422 with 555 illustrations, 21 in colors. Philadelphia: Saunders Co., 1925.

This work of Anders and Boston is truly a unique work. Its mission is very modern, but the execution of this mission is foreign to present-day texts. The form used in the portrayal of this mission reverts to the bedside text which existed before the advent of Osler and the modern era.

Such a criticism can not often be made of modern works, for there are few writers so talented as to include in a single volume a comprehensive, systematic, complete analysis of signs and symptoms essential for the establishment of medical diagnosis. In this text there is presented not only a complete essay on physical diagnosis, another on the evaluation of symptoms, another on general medicine and yet another on laboratory measures; but these procedures are arranged in a form similar to that used by the physician in arriving at his diagnosis of the condition under queston.

There is the usual division of diseases by systems: the respiratory, circulatory, digestive, urinary, nervous and endocrine systems beng grouped, separate from the acute infectious and parasitic diseases.

Designed for the instruction of the students of medicine in medical diagnosis, this text has outlined for itself a tremendous task. Their years of careful observation and bedside study together with enviably successful pedigogical experience, qualifies the authors for the successful completion of such an ambition

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TUMORS OF THE GLIOMA GROUP. A histological classification. By *Percival Bailey* and *Harvey Cushing*. From the Surgical Clinic and Laboratory of the Peter Bent Brigham Hospital and the laboratory of Surgical Research of the Harvard Medical School. Cloth. Price, $5.00. Pp. 175 with 108 illustrations. Philadelphia: Lippincott Co., 1926.

The term glioma is one that has been used to include a multitude of intracranial tumors, without reference pathologically to their structure, or clinically to the prognosis and treatment. The present monograph and classification is the outgrowth of twenty-one years of accurate clinical and pathological observations, during which time the records and material of over 400 verified gliomas were studied. The method of study that has been used by the writers is unique. Full responsibility was assumed by them of not only the immediate surgical procedures but also the preliminary bedside studies and diagnoses, and the postoperative laboratory examination of the tissues which followed them. Furthermore, they made, for the most part, their own necropsy examinations, and prepared and retained the pathological specimens. All information pertaining to the cases is thereby obtained.

Cerebral gliomas constitute about 42 per cent of all intracranial new growths. Heretofore, diagnosis, localization and technical methods of removal have occupied the limelight. It is no less important, from this discussion, to obtain a clear understanding of the life history of the lesions to be treated, for upon this depends not only the type of treatment to be employed but also the prognosis of the case.

The material presented is given in an organized, simple and comprehensive manner. Numerous photomicrographs, gross specimens, and charts vivify the data offered. The typographical work and the general make-up of the book is to be commended. It is a monograph illustrating the applicability of laboratory observations to clinical use.

PRACTICAL DIETETICS IN HEALTH AND DISEASE. Second revised edition. *Sanford Blum*, A. B., M. S., M. D., Head of Department of Pediatrics, and Director of the Research Laboratory, San Francisco Polyclinic and Post Graduate School. Pp. 362. Price, $4.00. Philadelphia: F. A. Davis Co., 1926.

The popular conception that medicine means drugs—capsules, colored pills and nasty tasting liquids—is daily being disputed by practitioners. But when asked "What can I eat, Doctor?" the most of us have to hedge, "Low protein, salt-free diet."

Food is one of the best or worst "medicines" that we have. To know and prescribe the correct food is a most impressive and valuable aid to the patient.

Diet should be individualized for each particular case, it being necessary to adapt it to the patient as well as to the disease. Besides being correct from the medical standpoint a dietary should possess two other virtues: It should be of such a nature that the patient can follow it and will follow it. Elaborate, time-consuming, and expensive diets will invariably fail. Inflexible rules and strict limitations are prone to be disregarded. Moderations in the applications of restrictions will, whenever practicable, prove most advantageous.

A proper diet is fully as essential in health as in disease. Certain foodstuffs are not applicable to all

people. The author cites the example of milk, a food indispensible for infants and children, but too easily digestible for adults, forming too little residue to stimulate intestinal evacuation. Digestibility is another indispensible factor, for caloric value is valueless in food not assimilated.

In this text devoted entirely to dietaries, simplicity and clearness is outstanding. Normal diets as well as diets in disease are included. They are divided into two parts, dietary for adults in health and disease occupying Part I; dietary for infants and children in health and disease occupying Part II. Under these two main divisions the lists are arranged alphabetically under symptoms and diseases.

For the average practitioner it will be as frequently consulted as any desk reference.

PRACICAL MEDICINE SERIES 1926. Eight volumes. Under the general editorial charge of *Charles L. Mix*, A. M., M. D. Price, $15.00 for series. GENERAL MEDICINE, Vol. I, Pp. 737 with 27 plates ad 24 illustrations. Price this volume, $3.00. Chicago: Year Book Publishers.

In the first and largest (202 pages) portion of the volume, George H. Weaver, Clinical Professor of Pathology at Rush Medical College, with the collaboration of T. T. Crooks, Clinical Assistant in Pediatrics at Rush Medical College, considers infectious diseases and endocrinology.

Diseases of the chest, excepting the heart, are reviewed in 184 pages by Lawson Brown, Chairman of the Medical Board of Trudeau Sanatorium—tuberculosis being given its rightful precedence.

Robert B. Preble, Professor of Medicine at Northwestern University Medical School, presents a synopsis in 147 pages of the literature that has appeared in the last year on diseases of the blood and blood-making organs, diseases of the blood vessels, heart and kidney.

The last division of the volume (181 pages) is devoted to a discussion of the digestive system, metabolism and gallbladder by Ralph C. Brown, Clinical Professor of Medicine, Rush Medical College.

Great care has been taken in the selection of articles for the various departments, only the recognized and authentic publications being used. Such a group of abstracts collected and organized by competent men should contain valuable and handy information for every practitioner.

THE THYROID GLAND By *Charles H. Mayo*, M. D., Professor of Surgery; and *Henry S. Plummer*, M. D., Professor of Medicine, University of Minnesota, Mayo Foundation, Rochester, Minn. Cloth. Price, $1.50. Pp. 83. St. Louis: C. V. Mosby, 1926.

This monograph is the reprint of series number four, one of the Beaumont Foundation Lectures, held under the auspices of Wayne County Medical Society, Detroit, Michigan, in 1925.

The participants in the presentation of this monograph certainly need no introduction. The name of Charles H. Mayo is recognized in every tongue, while Henry S. Plummer is looked upon as one of the greatest of authorities on the thyroid gland and its normal and altered physiological states.

The material is divided into two parts. In the first portion, Dr. Mayo discussed the history of the goiter, followed by a presentation of the anatomy and physiology of the thyroid gland. The various theories and factors entering into the causation of goiter are given; the great question of the role played by bacteria is given separate attention; the biologic chemistry leading up to the momentous work of Kendall is sketched. Maurine and Kimball have done much to add to our knowledge of geographic distribution, which together with the statistical information complied from draft records makes valuable material from which to make interesting deductions. Our knowledge of the role of the parathyroids is summarized.

In the second portion Dr. Plummer divides his discussion into four headings. Function of the thyroid receives initial attention. His classification of goiter is then given, followed by discusson of the three hyperthyroid states—adenomatous or exophthalmic goiter and thyroid (and thyroxin) medication. The ocular findings and nervous phenomena are emphasized, the end results if ucontrolled being fatal. The few pages on the theory of dysfunction of the thyroid is well worth the time of any busy doctor for it presents in simple logical sequence the rational for the administration of iodin in exophthamlic goiter.

In this biphasic monograph there are many places wherein certain points are doubly discussed. There is, however, no duplication, no repetition; for each attacks the subject in his own manner but ultimatey arrives at the same conclusion. Such a short, snappy, yet complete review of this subject which still demands the attention of our foremost thinkers, should be in the hands of every medical practitioner.

PRACTICE OF OBSTETRICS. Sixth edition. By *J. Clifton Edgar*, Emeritus Professor of Obstetrics and Clinical Midwifery in the Cornell Univ. Medical College; and revised by *Norris W. Vaux*, Clinical Professor of Obstetrics in the Jefferson Medical College. Cloth. Price, $8.00. Pp. 779 with 684 illustrations, 5 colored plates and 38 figures printed in colors. Philadelphia: Blakiston's, 1926.

In this, the sixth edition of the text and the first revision by the present editor, very few changes have been made from the authors' original work. The ten original parts have been maintained.

The physiology of the female genital organs presents ovulation and menstruation, noting some unrecognized relationship between them, insemination, impregnation, rape and hygiene. In the discussion of ovulation and menstruation, Novak's recognized work is characteristic by its omission. The medico-legal aspect of obstetrics together with a brief study of rape is included —rendering valuable advice to the student of obstetrics.

The physiological pregnancy carries us through our normal embryological changes, establishing the diagnosis of pregnancy, determining the date of confinement and carrying the obstetrical duties up to this date.

Discussion of the pathological pregnancy is prepared anatomically. A wide field is covered, a variety of subjects are presented in a brief, systematic and authentic manner.

The section devoted to physiological labor is the most importat part of the text and it is the one most admirably discussed and illustrated. Stress is rightfully placed on an acquaintanceship with the bony pelvis and the relation of the fetus to it preparatory to delivery. The normal mechanism of labor is the strongest part of the text, well illustrated, clearly outlined.

In discussing pathological labor and physiological puerperium valuable information given the student; however, in the discussion of the pathological puerperium and obstetric surgery, there are many points at variance with our accepted teaching. For example, the use of pituitrin, styptic douches to control postpartum hemorrhage, the Kieland forceps, episiotomy and Caesarian section do not fall in line with our usual instruction. But different teachers have different methods and we are pleased to have the author voice his sentiments fearlessly. In spite of these few criticisms, right or wrong, depending largely upon the one who utilizes the method, this text has been and is a valuable standard text on obstetrics.

PHARMACOLOGY AND THERAPEUTICS. American edition. *E. Poulsson,* Professor of Pharmacology in the University of Christiania. English edition edted by *W. E. Dixon,* M. A,, M. D., F. R. S., Reader in Pharmacology and Assessor to the Reguis Professor of Physics, Cambridge. Pp. 519 with 32 figures. Baltimore: Williams & Wilkins Co., 1923.

The introduction by W. E. Dixon characterizes the accomplishment of the text. "Professor Poulson's *Pharmacology* is a standard work throughout the Scandinavian countries and Germany. Its translation into English should be welcomed by all interested in pharmacology as a science or applied therapeutics as an art, because it furnishes in a concise and interesting form continental teaching of drug actions, and, what is more important, the employment of remedies at the bedside,"

In the compilation of this text pharmaceutical and clinical facts are combined. Clinical experience was originally the only guide to therapeusis. Through animal experimentation fundamental facts were more clearly demonstrated. Employing these principles learned from laboratory methods and applying them in clinical research, valuable deductions have been made. In the present text the salient pharmaceutical principles necessary for an understanding of the action of drugs is clearly stated before alluding to their therapeutic application.

To present this material, six divisions have been made: (1) organic remedies acting after absorption; (2) organic substances acting locally; (3) salts of light metals, alkalies, acids, halogens, oxidisers, etc.; (4) heavy metals; (5) ferments and food-stuffs; and (6) antitoxins and bacterial products. The divisions are purely pharmaceutical but interwoven into this apparently dry material are many interesting personal and continental peculiarities.

Such a combine should prove very efficacious to the student in utilizing pharmaceutical principles and developing rational therapeusis, and to the practitioner as a work of reference.

HAY FEVER AND ASTHMA. ,By *Ray M. Balyeat* A. M., M. D., Instructor in Medicine, University of Oklahoma Medical School, etc. Cloth. Price. $2.00. Pp. 198 with 27 illustrations. Philadelphia: F. A. Davis, 1926.

The motive of such a text is excellent. To teach patients the changes in human physiology that result in the reactions we term hypersensitiveness and to direct them in making observations that will enable themselves to avoid their troubles and the doctor in unraveling them, such an objective calls for unique ability.

In constructing his text it is necessary to couch his medical conditions and phrases in simple language. There is danger in making the conditions appear too simple, resulting in a conveyance to the patient an impression that the diagnosis is usually so easy and self-evident and the treatment is so definite and efective.

The salient facts are placed in the hands of the hay fever and asthma patients. Correct emphasis is placed upon pollens as the etiological factors and the types of plants, together with illustrations of the most common ones, are enumerated. Mention is also made of the role played by foods, danders, powders, etc. The important mention of the relationship between asthma and hay fever to occupations, seasons and dstricts is not sufficiently given.

The text demonstrates a great deal of time, study and effort. The author is to be commended upon his achievement.

INTERNATIONAL CLINICS. Vol. III, thirty-sixth series. Edited by *Henry W. Cattell*, A. M., M. D. Cloth. Price, $2.50. Pp. 310 with 48 illustrations. Philadelphia: J. B. Lippincott, 1926.

The contents of this, the third volume of the thirty-sixth series, is divided into five parts. In the first part under Diagnosis and Treatment, Stanley Reimann and L. Snellbaker discuss *gastric function* following operations on the stomach. *Functions of the liver* and their appraisal is given by Wm. Fleming. Francis Richardson reviews the *disease factor in history*. A summary of *the present knowledge of vitamins* and their therapeutic importance is given by N. Philip Norman. *Blastomycosis of the cornea* is discussed by S. Hanford McKee, followed by a *very high pressure clinic* by Louis F. Bishop. *Acute primary pneumonia* receives the attention of Coursen B. Conklin. A study of *discharge convulsions simulating epileptoid or epileptiform seizures* is made by L. Pierce Clark. Julius H. Hess presents the question of *acidosis and alkalosis in infancy and childhood*. *Radio-ionic medication of uranium in the treatment of cancer and of subacute and chronic infections with or without ulceration* receives the review of Henry F. Harris. The *management of bronchial asthma* is a much studied problem and is presented in admirable form by Nathan S. Schiff. *Nervous, delicate and backward children* merit the attention of E. Bosworth McCready. *Primary carcinoma of the lung* are discussed by Mathew W. Perry.

In the second portion, Neurology, Psychiatry and Psychology, the presentation of *brain anatomy at the University of Zurich* is given by Professor M. Minkowski. Moses Keschner and Herman Selinsky discuss the *extra-pyramidal system and its diseases*. Theories of the *unconscious and the instincts* is given by Professor W. R. Hess, followed by a presentation by Professor Oswald Burke of *psycho-analysis*.

Surgery takes up but three subjects, *declivous incision* with thoracotomy in the treatment of empyema by Domenico Taddei, *stab wound of the chest* by Ralph E. Bettman and Edward Binswanger, and *infected dermoid cyst by* Frederick Christopher.

Travel comprises a study of Italian medicine. L. B. Wilson gives *notes on European medicine and medical education with special reference to conditions existing in Italy*. The *present renaissance of Italian medicine* is reviewed by the editor, Henry W. Cattell. An *address of welcome delivered in the senate chamber of the Campidoglio* by *His Excellency Signor Filippo Cremonseli*, the Governor of Rome, at the reception for the members of the Interstate Post-Graduate Assembly of North American Physicians in Europe, followed by an *address by the Honorable Minster Fedele*, representing the head of the Italian Government, and a *discourse of Professor Dalla Vedova* are very interesting. A *speech of Doctor Raffaele Bastianelli*, President of the Italian Medical Reception Committee, is given. The *Pope's address* delivered to a group of American and Canadian physicians at the Papal Audience, Vatican, Rome, is also printed. An *address of the President of the Faculty at Pisa, Italy*, completes the collection.

The fifth division is devoted to a *biography of the Right Honorable Sir Clifford Allbutt* by Humphrey Rolleston.

MASSAGE AND THERAPEUTIC EXERCISE. By *Mary McMillan*, Supervisor of Aides in Physiotherapy, Medical Corps, U. S. A., 1919-20; Director of Physiotherapy, Harvard Medical School, 1921-25. Cloth. Price, $2.50. Pp. 331 with 117 illustrations. Philadelphia: W. B. Saunders, 1925.

An old art revived, massage—representative of the entire field of physiotherapy—is rapidly coming into its own. Utilized to the relief of suffering and in the reconstruction work resulting from the World War, physiotherapy received such an impetus as to carry it into modern medicine.

Miss McMillan was an active figure in this department of medical war service, training aides to carry on the work and carefully observing the results obtained. A summation of her previous training and added war experiences is valuable.

The different movements used in massage are described and their application to conditions outlined. The second division is devoted to therapeutic exercises. The exercises for the various deformities are presented.

Physiotherapy has found its place in reconstruction work, industrial surgery, being particularly applicable in the after treatment of fractures and nerve injuries. Its benefit is being proven daily; but like all therapy, benefit is directly proportional to its correct application. Such a book as this offered by Miss McMillan is valuable for student, nurse or doctor undertaking the application of massage or therapeutic exercise.

THE SURGICAL TREATMENT OF GOITER. By *Wilard Bartlett*, A. B., A. M., M. D., D. Sc., F. A. C. S.. St. Louis. With a foreword by *Charles H. Mayo*, M. D. Pp. 365 with 150 illustrations. Price, $8.50. St. Louis: C. V. Mosby Co., 1926.

Our knowledge of goiter is one of the most recent advances made in medicine. Following in its wake must necessarily come the development of our surgical measures. The outgrowth of this study can be appreciated by an analysis of this text.

This monograph has prepared in detail the elaborate procedures necessary in the preparation, operation, and after-care of goiter patients. It is designed primarily for the young general surgeon who is desirous to broaden his experience in the special field of thyroid surgery; for it is in this type of surgery that a mechanical trend of mind, an appreciation for details, and a love for artistry is most valuable.

The organization of this subject may be divided into historical and pathological consideration, preoperative, operative and postoperative care. The pathology is discussed by Louis B. Wilson. An important consideration of heart in goiter is given by Samuel B. Grant. The occurrence of a necessary goiter operation together with another operation, the indications for thyroidectomy, the preparation of the patient, position of the table and anesthesia are all admirably presented. but the details of the various technics to be used are most valuable to the younger surgeon for whom the text is prepared. Complications are always to be anticipated for the surgeon must be ready to meet any emergency that may arise. The chapter of laryngeal complicatons by French K. Hansel is particularly valuable.

The worth of such a text cannot be measured. Dr. Bartlett is to be congratulated for placing before the profession in such an assimilable manner the results of his experience.

HUMAN PATHOLOGY. By *Howard T. Karsner*, M. D., Professor of Pathology, School of Medicine, Western Reserve University, Cleveland, Ohio. Cloth. Pp. 980 with 20 illustrations in color and 443 black and white. Philadelphia: J. B. Lippincott, 1926.

According to Dorland, medicine is "the art and science of healing diseases," while pathology is "that branch of medicine which treats with the essential nature of disease." From such a conjecture, practicing medicine without an understanding of pathology is practicing empiric medicine. Much of our present treatment is empiric, but one should be able to practice more scientific medicine, knowing the altered morphology and changed physiology.

The purpose of this work is "to present the morphological alterations incident to disease, in the light of modern views as to their functional significance." In this world of ours time is the only constant, unchangeable factor. All protoplasm ages. From the time we come into this world until we leave, our protoplasm is constantly changing, and its function must change correspondingly. Changing or altered physiology is pathology. Life then is itself pathology. Complicate these normal processes with bacteria, chemical and mechanical alterations and our diseased states result. It has been attempts at classification and inclusion of these endless conditions that has heretofore lead to morphological texts.

It is the evaluation of these conditions and a presentation of pathological anatomy and histology, related to the broader functonal aspects of disease that characterizes this text. Simon Flexner summarizes the text when he states in his introduction: "the work covers the field of general pathology, pathological or morbid anatomy, pathological histology, functional or pathological physology, and the general subjects of bacteriology and immunology." In this text the fundamental facts necessary for a knowledge of the *essential nature of disease* are given.

The usual pedagogical division of the subject into general and special pathology is used. From the experience of the author such an arrangement proves most successful for the student. To facilitate further study references to special articles and treatises are given.

Such a text is a prize possession, a vauable addition to the English literature of pathology and a monument to a wonderful scholar.

OLD MASTERPIECES IN SURGERY. Being a cllection of thoughts and observations engendered by a perusal of some of the works of our forbears in surgery which appeared in serial form in *Surgery, Gynecology and Obstetrics* during 1924 and 1925. Privately published by *Alfred J. Brown*, M. D., Omaha, 1926.

Within the space of a few pages Dr. Brown has presented a comprehensive review of ancient surgery. The book consists of a collection of sketches which have appeared monthly in the *Journal of Surgery, Gynecology and Obstetrics*. Each article consists of illustrations taken from the volume of an ancient surgeon, and opposite the illustrations brief extracts from the pages and a discussion of the life and times of the master. The illustrations are beautifully printed on an imitation Van Gelder paper, and the text is written in a manner which shows a fine appreciation of the important points in the writings of the early authors. Among the more familiar subjects are Vesalius, Ambrose Pare, Albucasius, Fabricius and Tagliacozzi. In these descriptions we get a glimpse of the difficulties which beset the pioneers who had the courage to withstand the ridicule and opposition of their contemporaries who considered a departure from the teachings of Hippocrates and Galen as heresy.

This series of artistic descriptions comes at a most opportune time. With the present day tendency to become materialistic and to emphasize the technical side of medicine, we must be cautious not to become narrow and cold in the pursuit of skill in the science of medicine. A study of the history of medicine will do much to develop broadmindedness and tolerance, quali-

ties which are essential to development. By familiarizing ourselves with conditions as they existed in ancient days we will recognize our errors in those of the early practitioners, and will thus be better able to overcome them.

One is at once struck by the intensive study and work involved in the preparation of these articles. They reflect the mind of a scholar and artist. Dr. Brown has indeed performed a great service to the profession by introducing in so pleasing a manner a branch of medical study which has been much neglected.

J. A. WEINBERG, M. D.

TEXTBOOK OF OBSTETRICS. By *Thomas Watts Eden*, M. D., C. M., Edin., F. R. C. P., Lond., F. R. C. S., Edin, Major R. A. M. C., Consultng Obstetric Physician to Charing Cross Hospital, Queen Charlotte's Lying-In Hospital, and to Chelsea Hospital for Women, Examiner in Midwifery, Univ. Cambridge; and *Eardley Holland*, M. D., B. S. Lond., F. R. C. P., Lond., F. R. C. S., Eng., Obs. and Gyn. Surgeon and Lecturer London Hospital; Surgeon City of London Maternity Hospital, Examiner in Midwifery and Dis. Women, Univ. Cambridge and Conjoint Board of England, Late Examiner in Univ. London and Durham. Cloth. Pp. 704 with 7 plates and 393 illustrations. New York: Mamillan Co., 1925.

In this the sixth edition of the text by the original author, but the first revision by the conjoined writer, a complete revision has been made. The original style of the text has been maintained. but the material is brought up to date. It has required much pruning and compression to construct two entirely new sections yet reduce the original number of pages by 40. Such a consolidation will be welcomed by the student who uses this book for his reference text.

The material has been divided into nine parts. Under normal pregnancy the normal histology, physiology, diagnosis and management of pregnancy has been considered. It is natural to discuss abnormal pregnancy in the succeeding portion. Here toxemias, hyperemesis, diseases of the membranes, uterus, etc., are given, except diseases of the foetus which are included in an individual portion later on injuries, diseases and death of the foetus. Part three presents in an admirably clear manner normal labor, followed by its pathological conditions in the succeeding portion. Puerperium physiological and pathological are included together. Individual attention is given the new born child, discussing breast and artificial feeding, premature infants, hemorrhages, injuries, etc. Another new position has been created for a statistical study of maternal mortality in childbirth, maternal ill health resulting from child birth and antenatal supervision. The old portion devoted to obsteric operations has been much revised, especially the sections on forceps and Caesarean section.

The text has long since proven its efficacy as a teaching text for students of obstetrics. With this revision, its value should be greatly increased.

HANDBOOK OF DISEASES OF THE RECTUM. Fourth edition. *Louis J. Hirschman*, M. D., F. A. C. S., Ex-Chairman, Section on Gastro-Enterology and Proctology, A. M. A.; Ex-President American Proctologic Society; Professor of Proctology, Detroit College of Medicine., etc. Cloth. Price, $6.50. Pp. 403 with 252 illustrations and 5 colored plates. St. Louis: C. V. Mosby, 1926.

The first edition of this greatly appreciated text was designed primarily for the general practitioner and student of medicine—"who is the general practitioner of the future." Its object was the presentation of anorectal diseases in such a manner as to qualify him to diagnose and treat patients suffering from these diseases as scientifically and as successfully as he does affections of other organs in other localities. In the revision of this text from time to time, this primary object has been kept in the foreground. That it filled a long felt need is implied in the three revisions since the initial publication in 1909.

The subject matter is well balanced and exceptionally well treated. In the first five chapters the necessary didactic and elementary principles are taught: anatomy of the rectum; symptoms referable to the rectum; examination of the patient; technic and limitations of local and sacral anesthesia. The other eleven chapters deal with specific anorectal conditions.

Throughout the text one is impressed with the sincereness of the author and the apparent pleasure that it has been for him to detail his task. No stone has been left unturned. Interweaving into the didactic facts personal observations and individual experiences, he inspires his reader. With the numerous splendid illustrations he vivifies his subject. The simple, clear. concise descriptions and discussoins bring confidence to the student and prepare him for his task.

A familiarity with this subject is essential for every general practitioner. No opportunity presents itself in fewer or better pages.

INTERNATIONAL ABSTRACTS

The Action of Ultra Violet and Luminous Rays in Therapy. By Carl Sonne, Copenhagen. The British Journal of Radiology, XXXI, 312, July 1926.

The phototropism of animals expresses itself especially in regard to rays of short wave length. Light plays an important part in the household of nature, but there is, in this respect, a very considerable difference between the vegetable world and the animal organism. We must be careful not to draw too far-reaching analogies between the general effect of light in nature and its specific effect on the animal organism

In light therapy, the term "light" is used to signify not only the visible, luminous rays, but also the invisible, ultra violet rays. The greater part of the energy which we receive through light is due to its conversion into heat. The question thus arises as to whether the heating effect of light has any special action on the organism.

Light has an absolutely certain effect upon rickets and upon tetany (which is related to rickets), and we also know of its curative effect upon surgical tuberculosis. Not only does the latter require much more prolonged irradiation, but we do not know for certain which rays, the ultra violet or the luminous rays, are the effective ones, or whether it is a combination of the two. In the case of rickets, we know that the luminous rays are quite without effect.

Ultra violet rays increase the inorganic phosphorous in the serum of not only the rachitic, but also of the normal animal. This increase is due to an increased absorption of phosphorous from the digestive canal. The same fact applies to calcium. Cod liver oil and irradiated foods act in the same way as ultra violet rays. This similar action of irradiated food stuffs might help us to arrive at an explanation of the mechanism whereby ultra violet rays increase the inorganic phosphorous and calcium in the serum. Cod liver oil and irradiated substances will blacken a photosensitive plate. Still, cod liver oil does not show any ultra violet rays upon spectroscopic examination. Therefore, cod liver oil and irradiated foodstuffs are not in themselves radio-active, but produce their effect upon the photosensitive plate. Thus the anti-rachitic action of the light bath is probably due to an action upon the skin surface fat. This action may be a chemical conversion—a splitting, an oxidization of the lipoids or production of ferments. When these products are later absorbed by the organism, they produce a beneficial action in rickets.

In regard to surgical tuberculosis, investigations made at the Finsen Medical Institute, show that quartz mercury light, which produces the most ultra violet rays, is not as effective as the carbon-arc light, which contains far more visible rays. Sonne has found that visible rays have a specific capacity of heating the blood in and beneath the irraditaed skin to a very considerable temperature. In certain pathological conditions this heat absorption destroys the toxins, either because the latter are thermolabile or because the formation of antitoxins is promoted by such heating of the blood. If the existence of a thermo-labile tubercle toxin could be proved, we would have an explaation of the beneficial action of the light bath in surgical tuberculosis.

On the whole, it is not yet possible to give any satisfactory explanation for the beneficial action of the light bath upon certain diseases. Considerable progress towards that end has been made during the last years, however.

I. L. SHERRY, M. D.

Light in the Prevention of Rickets. By Francis Howard Humphris, M. D. Brux., F. R. C. P. Edin., D. M. E. and R. Camb., London. Physical Therapeutics, Sept., 1926, XLIV, No. 9.

The therapeutic value of ultra violet energy in rickets has been proved beyond doubt. Rickets is a disease or aberrancy of the bony tissues due to, or characterized by, a calcium and phosphorous deficiency, as well as by lack of the fat soluble vitamin-A. Ultra violet ray therapy raises the calcium and phosphorus content in the body and also increases the energy of the fat soluble vitamin-A.

There is a close relationship between light and diet in the etiology of rickets. When the diet in experimental animals remains a constant standard rickets-producing diet, rickets will either develop or not, according to the dosage of light. Humphris believes that the same reciprocal relationship between light and diet

prevails in regard to infantile rickets. Ultra violet radiation has the power to raise the calcium content in the blood, and is a reliable therapeutic measure which will cure and prevent rickets.

Humphris suggests that the practical prophylaxis of rickets should begin as soon as pregnancy is proved. In the patruient female there is normally a great drain on the calcium metabolism and owing to this drain, the seeds of rickets may be sown in the child before it is born. or the welfare of both mother and the child there should be some form of light therapy throughout her pregnancy and later throughout lactation. Where this cannot be done, every child should be rayed for a month or six weeks during his first year of life. The prevention of rickets in the children of a nation is as much a national duty, as is vaccination against smallpox.

I. L. SHERRY, M. D.

Medical Diathermy. F. B. Granger, M. D. The Ohio State Medical Journal, November, 1926.

The form of electrcity which we now call High Frequency, was first suggested for medical use by Nikola Tesla, in 1891. D'Arsonval commenced this investigation in 1898. Nagelschmidt of Berlin in 1907 demonstrated that high frequency currents produced a heating through of the tissues, and gave this property the name "Diathermy." Diathermy is a high frequency current, ordinarily of the D'Arsonval type, with sufficient voltage to overcome tissue resistance with oscillatory rate ranging from 750,000 to 1,000,000 oscillations per second and with sufficient amperage or quantity to heat. Diathermy is true conversive heat, that is, heat generated in the tissues; hence it penetrates deeply and to no small degree uniformly. In dead tissue it is possible to demonstrate the heat effects between the electrodes and to show by thermometers that the highest temperature is recorded at almost any predetermined point, dependent on the size of the smaller electrode.

Major W. D. McFee showed by animal experimentation (at the Walter Reed General Hospital, Washington, D. C.) that it was possible to cause increased heat production in living tissue. A thermometer was inserted in the rectum of a rabbit; both hips were shaved and electrodes of equal size were securely affixed; a current strength of 1,000 milliamperes was employed; after some minutes a rise of several degrees was recorded in the rectal thermometer.

Diathermy seems to cause a local, active, deep-seated hyperemia, thus promoting: first, tissue drainage; second, an influx of arterial blood with its nutritional value; third, an increase in the leukocytes of which the phagocytes may play some part. There are four methods of application of direct diathermy; the lateral method insures the greatest concentration of heat to a given local area in the shortest time. The double cuff method is less efficient and probably heats the deepest structures by conduction. Its time of application is much longer. The cuff and water method is still less efficient. It is ordinarily used where the fingers or toes are to be diathermitized. The labile method, because of its more or less constant motion, gives a superficial, but more generally diffused surface heating. Only a metal contact should be used and great care should be taken in the preparing of metal electrodes. They should be perfectly smooth so that no undue pressure may be exerted; if they have been used before, good contact should be insured by rolling them with a squegee, such as photographers use.

Until the American Medical Association secures standardization it will be necessary for each physician to work out his own standardization for his particular machine. It can be safely said that from 50 to 100 milliamperes per square inch of contact based on the square area of the smaller electrode is a safe rule. If the arteries are sclerotic and the circulation more sluggish than normal, it is better to limit the maximum to the lower limit of 50 milliamperes. The time of treatment cannot be exactly interpreted in minutes, as the result and the reaction are the main factors; in general it takes at least 20 minutes to thoroughly heat a part. The frequency of treatment depends on the underlying pathology. The author has treated several cases of chronic bronchitis with an irritating cough, by means of diathermy and air-cooled ultra violet, with very satisfactory results.

So-called essential asthma is in the same category as bronchitis, both as to technique of treatment and claims as to results. It would seem rational to expect that the relaxing effects of diathermy ought to relieve the muscular spasm. Frequently a very acute neuritis will be more quickly relieved as regards pain, by diathermy than by any other method. For sprains a good treatment is diathermy to promote an active circulation with consequent drainage; this should be followed by some of the following mechanical stimuli: massage, static wave current, the sinusoidal, the Bristow coil, or static sparks. Myositis ossificans will apparently run its cycle in two-thirds of the usual time provided plenty of diathermy and little of active manipulation is used.

The contraindications for the use of diathermy are: first, pus without drainage; and second, lesions where there is likelihood of hemorrhage. Diathermic heat is of value in treating pneumonia as it diminishes pain, improves transiently the heart's action and induces sleep. In the Brooklyn Naval Hospital diathermy is employed as an adjunct on every case, as soon as the diagnosis is made. It is also used at the On-Shore Sta-

tion of the Boston Floating Hospital. The author presents special technique for joints of fingers and toes, ankle and wrist, knee, hip, shoulder, spine; he also mentions special applications of diathermy for sinuses, antrum, brain, eyes, middle ear, kidney. spastic gut and coccyx.

Shall Cancer Be Treated by Radium or by Surgery? C. C. Harrold, M. D., The Journal of the Medical Association of Georgia, October, 1926.

X ray is used as an adjunct to surgery in cancer of the breast. In superficial keratosis and in skin cancers radium is the accepted treatment; if the skin involved is on the ear, the cartilage complicates the treatment. If the keratosis can be destroyed without exposing the cartilage or setting up a perichondritis, radium is indicated. It is less painful and just as safe to excise a portion of the ear with the cartilage, if the lesion is far advanced. In extensive ear cancers the ear should be removed surgically. In radium institutions, radium is used exclusivey, in cancer of the tongue. Radium is the treatment of choice in cancer of the cervix and complete hysterectomy in cancer of the fundus.

The author has under his observation at present, six cases of cancer of the parotid, which he is treating with radium; all are doing well, with no paralysis and only one slight fistula which is closed now.

The Role of High Frequency Currents in the Treatment of Neoplastic Disease. H. H. Bass, M. D. Virginia Medical Monthly, October, 1926.

Operative surgery, radium and x rays are equally importat in the treatment of malignant disease. Experience has demonstrated the extreme importance of electrothermic methods. There seems to be some discussion as to the proper nomenclature of high frequency terms. The terms in this article, with reference to desiccation, were first introduced by Dr. W. L. Clark of Philadelphia, who named them according to the macroscopical effect upon tissue. The coagulation term originated with Dr. E. Doyen. The high frequency currents are those in which the vibrations and oscillations are so rapid that there is no faradic effect upon the tissue. There is no contractility or muscular response to the currents; only heat is produced, caused by the resistance the tissue offers to the passage of the currents, with its millions of vibrations and oscillations per second.

There is an impression among many that the desiccation and the coagulation currents are one and the same; this is an error. Desiccation is produced by a monopolar current of the Oudin type, and consequently, is of high voltage and low amperage. Its effect upon the tissue is that of a drying or dehydrating proces. The structures can be completely mummified without charring. There are many variations in the technic employed in the treatment of superficial and deep-seated lesions. The desiccation method is used advantageously when the lesion is localized and a good cosmetic result is desired. Infected tonsils are successfullp treated by the desiccation method, and is especially indicated where it is desired to conserve the capsule as a barrier to infection. It is the preferred method in cases attended with great surgical risk. The tonsil can be desiccated down to its capsule without pain, hemorrhage, or secondary inflammation, by a topical application of a 10 per cent cocaine solution, the current sterilzing and destroying all infected tissue.

Coagulation is produced by a bipolar high frequency current of the d'Arsonval type, utilizing a multiple spark gap. There are numerous electrodes of different shapes, for the treatment of cancer by this current, from the technique of Doyen to the flat electrodes of Corbus. It is well to go beyond the diseased area so as to be certain that all diseased tissue is included. After the coagulated tissue has been removed, then a less intensive current should be used, to stop all bleeding and protect the wound from future hemorrhage.

All extensive lesions about the tongue or mouth should be preceded by ligation of the external carotid arteries before being treated. The electrothermic methods should not be used by one unless he has had surgical training, as these are distinctly surgical procedures. The efficiency of these methods is increased in some cases by the judicious use of operative, surgery, radium and the x rays. The electrothermic methods should be used alone only in localized tumors of a type which do not tend to metastasize. The after care of wounds done by coagulation, requires closer attention than those done by desiccation. The desiccation wounds are dry and do not require the constant care and dressing Investigation, of the effect of the currents on the cells and blood vessels in the immediate and remote areas of the field of operation, was made in the pathological laboratories of the Clark-Bass Hospital. The material used consisted chiefly of epithelioma (basal and squamous-cell types) and normal tissues of laboratory animals. The cells submitted to desiccation were shrunken and shriveled and their nuclei condensed and elongated without a suggestion of cell outline. In the case of coagulation, the cell outline was entirely lost; the affected tissue presented a hyalinized appearance. Guinea pigs and rabbits were used to observe the cell reaction

likely to occur in the zone adjacent to the area treated. Small areas of skin, sub-cutaneous tissue and muscle were submitted to desiccation or coagulation treatment; several days later sections were removed for study. They revealed practically the same tissue changes, but there was in addition round cell infiltration, and in certain areas this infiltration was localized around the blood vessels.

Radiation Therapy in Cancer of the Oesophagus. B. F. Schreiner, K. F. Eschelman, and L. C. Kress. The Journal of Cancer Research, July, 1926.

Among 5,125 cases admitted to the State Institute for the Study of Malignant Disease, in Buffalo, N. Y., during the past twelve years, the records show 63 cases of cancer of the oesophagus. It is one of the most hopeless forms of malignant disease. These cases were all far advanced cases of malignancy in which the diagnosis was easily established. Not any of the cases were clinically healed; the length of life varied in time from a few days to eleven months, with one exception, who lived one year and four months. Some of these cases were treated with high voltage x rays in divided doses and radium tubes and some with radium pack and gastrostomy. Gastrostomy, to be of any value, must be done early, before there has been marked loss of weight The early diagnosis of cancer of the oesophagus is apparently difficult. All patients complaining of pain or slight difficulty in swallowing should have routine examination of the oesophagus with x rays and an oesophagoscopy.

The Treatment of Pruritus Ani by Electric Ionization. E. L. Oliver, M. D., Archives of Dermatology and Syphilology. Vol. 14, No. 5, Nov., 1926.

Professor Leduc of Nantes, France, was the first to utilize ionization for therapeutic purposes. He discovered the laws regulating its application and also the properties of the ions of many substances. Lewis Jones was the first English exponent of ionization therapy in various conditions. As the tissues of the body contain water and various salts in solution, a portion of them in ionic form, it is evident that an electric current passed through the body will cause a movement of ions, the positively charged ion toward the negative pole and the negatively charged ion toward the positive pole. Professor Leduc's experiment with rabbits demonstrates that this movement of ions does actually occur. In this experiment, two rabbits with flanks shaved were placed side by side. To the inner flank of each was applied a pad moistened with sodium chloride solution, and to the outer flanks were attached pads moistened with a solution of nitrate of strychnine. In one rabbit, the positive pole was connected to the sodium chloride pad and the negative pole to the strychnine pad; in the other rabbit, the poles were connected in the opposite manner. After a few minutes, the rabbit in which the positive pole was attached to the strychnine pad developed convulsions and died. The strychnine had entered at the positive pole, for the strychnine ions, being positively charged, were attracted toward the negative pole and flowed into the tissues. The other rabbit was unharmed. In a similar manner, antiseptic substances may be made to enter the tissues of the body. It is generally conceded that in many cases of essential pruritus ani, the pruritus is due in a large measure to an infection of the perianal skin. Murray's work led him to believe that Streptococcus fecalis was the causative organ; others have been led to believe that the colon bacillus is of equal or greater importance. Leduc states, trusting to clinical evidence, it can be said that antiseptic ions can be driven in to a sufficient depth to make them valuable in combating infective conditions. Rolfe was the first in the United States to employ this method of treatment in pruritis ani. It has been highly spoken of by many proctologists of standing, notably Dr. F. C. Hill, who writes: "This method, which I have used for nearly three years, has proved remarkably successful; I have found it promising above all other methods of local treatment and curative to a very satisfying degree in a disease so obdurate to treatment as pruritis ani." Buie of the Mayo Clinic read a paper in 1924 based on his results with this method in 100 cases. In only 10 per cent was there failure in cases in which he believed sufficient treatment had been given.

The author treated 30 patients with ionization, nearly all with 1 per cent mercuric oxycyanide. More than a year later, of the 30 patients, 7 stated they were cured; 10, very much improved; 7, slightly improved; 6, no improvement. Of the groups showing slight, or no improvement, 8 of the 13 had received four treatments or less each. As fewer than eight treatments is not a fair test of this method, perhaps half of this group would have been cured or greatly improved had they given the treatment a fair trial. Ionization with antiseptic substances should theoretically prove of value, for by this means antiseptics do actually enter the tissues, and while it is not proclaimed as a sure cure, yet it is an additional therapeutic measure in the fight against this distressing malady.

The Treatment of Epithelioma of the Skin. G. E. Pfahler, M. D., The Atlantic Medical Journal, March, 1926.

Pfahler believes that cancer of the skin is curable in practically all cases if treated skillfully and thoroughly, before it has infiltrated the deeper tissues and involved the cartilage, bone, muscle, mucous membrane or glands.

The first essential in the treatment of cancer of the skin is the accurate determination of the extent of the disease The failures are commonly due to an underestimation of this factor. This is true especially when dealing with the squamous-cell type, which leads to metastasis, often early. It is also true when any of the deeper tissues are involved by the basal-cell variety.

The three agents which have served best are radium, x rays, and electrocoagulation. Each has its place, and frequently two or three can be combined to advantage in the same case. The location and extent of involvement must be considered.

In epithelioma of the eyelids, radium will serve best. Electrodesiccation is effectual, but an objectionable scar is apt to form, which retracts the eyelid and gives rise to ectropion. If x rays or radium make no progress, electrothermic methods should be used, even if deformity must follow.

If epitheliomas of the face are treated early, thoroughly, and skillfully, the unsightly disfigurements due to advanced disease should be entirely eliminated. Proper care of the precancerous condition is important. This can be done by electrodesiccation, by x rays, or by radium.

Treatment of the squamous-cell type of epithelioma should be started as early as possible. The lesion should be destroyed thoroughly by electrocoagulation, and followed by heavily filtered x rays, or prolonged gamma radiation over the neighboring lymphatics.

Epithelioma of the lip can be cured if treated thorbasis of degenerating moles, burns, leg ulcers, chronic eczema, scars, etc. The treatment of these will vary with the location, character, underlying cause, and condition of the surrounding tissue.

Epithelioma of the lp can be cured if treated thoroughly and skillfully. The best method is complete local destruction by electrocoagulation, to be followed immediately by a full erythema dose of high voltage x rays of short wave length; and at the same time, or within a few days, a full erythema dose of high voltage x rays should be given uder the chin and into the submaxillary region. These epitheliomas of the lip are generally of the squamous-cell type, and give rise, often early, to metastases. For this reason the lymphatics should always be treated.

When the high frequency current for electrocoagulation, or electrodesiccation is employed in the treatment of malignant disease, it must be used sufficienty to destroy all of the diseased tissue, and this should be done at one sitting. When radium or x rays are used to destroy epithelioma, it must be given sufficiently to produce an erythema, and this effect should be kept up usually for ten days to two weeks. This requires much skill, careful measurement of the rays and a knowledge of the principles of the biologic effects. The depth value must be obtained by the use of filtration, proper distance and proper direction, or cross-firing. Early diagnosis is essential.

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